绿色交通
中欧生态城意见书

2018 年，1 月
What is EC-Link?

Europe-China Eco cities link project (EC-LINK,) is a European Union founded project, a key element of the EU-China Partnership on Sustainable Urbanisation, which was signed by the European Commission and the Chinese government in May 2012.

It aims to assist Chinese cities in implementing energy and resource-efficient measures by sharing European cities’ experiences in sustainable urbanisation. Meanwhile, EC-Link has created a platform of experience for easy accessible exchange between Chinese and European cities on low carbon/eco city development issues.

Enhancing communication and providing training to Chinese related organizations and its’ staff on policy making, giving technical advices on specific sustainable urban development projects will contribute a lot to China sustainable urbanization.

EC-Link has produced Eco city toolboxes, a Knowledge platform and is organising city-to-city cooperation in the frame of City Network Units’ activities (CNUs). CNUs activities are focussed on pilot actions implementation based on the joint work of Chinese and EU experts for a common objective, chosen in the frame of sustainable urbanisation issues.

Our aim is to increase learning curve from European cities’ good examples & techniques, strategy and methods. These activities enhanced the communication between Chinese cities and European cities, which formed a solid base for the further cooperation.  

http://eclink.org/en/  

PREFACE
China’s Commitment to Mitigate Climate Change

In 2015, China was one of the first Asian countries – besides Japan and South Korea – to come out strongly with a commitment to combat climate change, and to adapt to eventual future impacts.

Context. With its population of about 1,300 million people, China is one of the world’s major emitters of green house gases (GHG), and at the same time it is also one of the most vulnerable countries to the negative impacts of climate change.

Commitment. In preparation for the 2015 United Nations Climate Change Meeting (COP21) in Paris, the government of China has announced that its GHG emissions will peak in 2030. Equally, it is committed to reduce by 2030 by 60-65% the intensity of its carbon usage in relationship to its gross domestic product (GDP), compared to 2005 levels. It will take on the responsibility to increase substantially its forest cover, and will ensure that by 2030 some 20% of its energy requirements will be covered by renewable energy.

Actions. The country’s measures will include mitigation of its contributions to GHG emissions, and it will introduce adaptations measures to cope with negative impacts of climate change in food production, protection of its population, and in climate-proof infrastructure. China aims at biding climate change agreements under the COP21. The international community sees the proposed measures as ambitious but achievable. Since several years, China has started with low-carbon development. Today it is working towards a full-fledged program of green development of its economy.

Eco-Cities and Climate Change

China’s activities to create eco-cities must be seen as part of its contributions to low-carbon development with aim to mitigate climate change. Among the various support mechanisms which exist, to support low-carbon development, the Ministry of Housing, and Urban-Rural Development (MoHURD), is being supported by the European Union (EU) through the Europe-China Eco-Cities Link Project (EC Link).

Background. The main objective of the EC Link project is to serve as a support mechanism to the Ministry of Housing and Urban-Rural Development to implement its sustainable low-carbon urbanisation agenda. The project will support the Ministry in 4 strategic areas:

1) Demonstrate best approaches to implement low carbon solutions by introducing appropriate urban planning tools. Best practice low carbon planning will be identified in both Europe and China and made available nation-wide to municipal governments. Advanced planning tools will be deployed at the local level with the support of the project,
with a view to refining proposed low-carbon planning models and to scaling them up across Chinese provinces.

2) Serve as testing ground for innovations in specific low-carbon policies (e.g. energy performance labelling for buildings, intelligent transport systems, smart cities, GIS planning tools, eco city labelling schemes) and technologies (in the 9 sectors selected by the project: compact urban development, clean energy, green buildings, green transportation, water management, solid waste treatment, urban renewal and revitalization, municipal financing, green industries).

3) Improve Chinese Municipalities’ potential to finance low carbon solutions and notably their ability to attract private sector financing in the form of public private partnerships. The EC Link will support MoHURD to define innovative financial schemes, support feasibility studies and the formulation of finance and investment proposals, better coordinate and leverage investments undertaken by EU Member States, or to link projects to European financing institutions (e.g. European Investment Bank) and to European companies.

4) Establish knowledge networks and test the functionality of the support mechanism by leveraging, scaling up, and integrating transformative actions supported by the policy and technology tools developed under the project. The Knowledge Platform will demonstrate how strategic objectives have been translated at local level and how results have been integrated at national level for the definition of long-term best practices. Results will be shared via training and capacity building at local level, and via the knowledge platform set-up by the project at national and international level.

The EC Link Position Papers. MoHURD and the EC Link Technical Assistance Team (TAT) have identified 9 specific sectors for the deployment of technology based tool boxes. In all of these, Europe has a lot of knowledge and best practice to contribute to support the deployment of these solutions in China. These 9 sectors include:

- compact urban development,
- clean energy,
- green buildings,
- green transportation,
- water management,
- solid waste treatment,
- urban renewal and revitalization,
- municipal financing,
- green industries.

MoHURD’s Department of Science and Technology, EC Link’s direct counterpart, has issued targeted objectives for the deployment of policy, research and development and engineering agendas.
Users and Target Groups of Position Papers. The EC Link Position Papers will be utilized by personnel of the cities which are covered by MoHURD’s eco-city programme. This covers technical and managerial staff of these cities. Additionally, at central government level, MoHURD and other ministries may also make use of these Position Papers for the purpose of staff training and briefing.

Since these Position Papers are also going to be published in the EC Link website (www.eclink.org), also the general public is invited to make use of these Position Papers.

**Content of Position Papers**

**Sector overview:** The EC-Link Position Paper position papers provide an overview of each thematic sector (compact urban development, clean energy, green buildings, green transportation, water management, solid waste treatment, urban renewal and revitalization, municipal financing, green industries). It begins with a state-of-the-art review of the sector, and presents sector challenges as development objectives.

**Sector policy analysis:** As part of the sector overview, the EC-Link Position Paper position papers provide sector policy analysis, and a comparison of EU and Chinese sector policies.

**Comparison of European and Chinese experiences:** The comparison of real-life EU and Chinese project experiences are used to illustrate innovations and progress in the respective sector. Both for EU and Chinese cases, there is an overview of good practices, technologies and products, performance indicators, technical standards, verification methods, and lessons learnt from best eco-city practices.

**Tools:** This Position Paper contains four primary tools. Throughout the text of this Position Paper position paper there are flags to point at these primary tools (⇒ Tool GT 1, ⇒ Tool GT 2, ⇒ Tool GT 3, ⇒ Tool GT 3) At the end of the Position Paper paper there is an Annex with short summary descriptions of these primary tools.

The primary tools for Green Transport (GT) are:

- ⇒Tool GT 4: Planning for non-motorized transport.

It is understood that these primary tools, do contain numerous secondary tools which cannot be elaborated in the context of this Position Paper position paper.
Position Paper - a living document: This Position Paper will be updated based on city-level real-life project experiences in the EC-Link pilot cities.

Possible misconceptions: These Position Paper position papers shall not be mistaken for ‘cook books’, or ‘how to do’-manuals like we know them from other subject fields (car repair, computer servicing, etc.). Urban development is too complex for such an approach. Upon request of MoHURD these position papers are addressing good practices and seek to provide tools for complex issues of green urban development.

DISCLAIMER

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## Abbreviations

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<td>ASI</td>
<td>Avoid-shift-improve (approach)</td>
</tr>
<tr>
<td>BHNS</td>
<td>Bus with a high level of service</td>
</tr>
<tr>
<td>BEV</td>
<td>Battery electric vehicles</td>
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<tr>
<td>BRT</td>
<td>Bus rapid transit system</td>
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<tr>
<td>CDBC</td>
<td>China Development Bank Capital</td>
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<tr>
<td>CNG</td>
<td>Compressed natural gas</td>
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<tr>
<td>CHIC</td>
<td>(EU-funded) Clean Hydrogen in European Cities</td>
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<tr>
<td>CIVITAS</td>
<td>City, Vitality and Sustainability</td>
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<tr>
<td>CSUS</td>
<td>Chinese Society for Urban Studies</td>
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<tr>
<td>EBSF</td>
<td>European Bus System of the Future</td>
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<tr>
<td>EC Link</td>
<td>Europe-China Eco-Cities Link Project</td>
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<tr>
<td>ETC</td>
<td>Electronic Toll Collector</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<td>GDP</td>
<td>Gross domestic product</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GHG</td>
<td>Green house gases</td>
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<td>GIZ</td>
<td>German International Cooperation Agency</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>ITDP</td>
<td>Institute for Transportation and Development Policy</td>
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<tr>
<td>ITS</td>
<td>Intelligent Transport Systems</td>
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<tr>
<td>KPIs</td>
<td>Key Performance Indicators</td>
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<tr>
<td>LCC</td>
<td>life-cycle costs</td>
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<td>LEZ</td>
<td>Low Emission Zones</td>
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<tr>
<td>LPG</td>
<td>liquid petroleum gas</td>
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<tr>
<td>MEP</td>
<td>Ministry of Environmental Protection</td>
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<tr>
<td>MFS</td>
<td>Mobility and Fuels Strategy</td>
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<tr>
<td>MoHURD</td>
<td>Ministry of Housing, and Urban-Rural Development</td>
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<td>MOT</td>
<td>Ministry of Transport of China</td>
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<tr>
<td>OBIS</td>
<td>Optimising Bike Sharing in European Cities</td>
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<tr>
<td>OECD</td>
<td>Organization of Economic Cooperation and Development</td>
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<tr>
<td>RACE</td>
<td>Rapid Assessment of City Emissions</td>
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<td>SUMP</td>
<td>Sustainable Urban Mobility Plan</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>TEEMP</td>
<td>Transport Emissions Evaluation Tool</td>
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<tr>
<td>TRIP</td>
<td>Transport Research and Innovation Portal</td>
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<tr>
<td>TDM</td>
<td>Travel demand management</td>
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<tr>
<td>TfL</td>
<td>Transport for London</td>
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<td>TIDE</td>
<td>Transport Innovation Deployment for Europe</td>
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<tr>
<td>ToD</td>
<td>Transit-oriented development</td>
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<tr>
<td>TCO</td>
<td>Total costs of ownership</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>ZeEUS</td>
<td>Zero Emission Urban Bus System</td>
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## Glossary of Terms

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<th>Term</th>
<th>Definition</th>
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<tr>
<td>Carsharing</td>
<td>Approach to reduce number of vehicles which have same start to end points.</td>
</tr>
<tr>
<td>Clean vehicles</td>
<td>Vehicles which use clean energy sources which are not based on carbon use.</td>
</tr>
<tr>
<td>Congestion charge</td>
<td>A congestion charge is being levied by some world cities (London, Singapore, and in future Beijing) to discourage private vehicular traffic to city centres. The congestion charge is being collected through smart cards which automatically deduct these fees when city centre toll stations are being passed.</td>
</tr>
<tr>
<td>Electronic toll collection</td>
<td>Smart toll payment station on express ways, or at city centre entrance points.</td>
</tr>
<tr>
<td>Green logistics</td>
<td>Transportation of goods through clean vehicles.</td>
</tr>
<tr>
<td>Green transport</td>
<td>Transportation means which use no or limited amounts of fossil fuels, preferably rather new or renewable energy sources. This could include the use of electricity generated through non-fossil sources (hydro-power, wind energy, gas, solar power).</td>
</tr>
<tr>
<td>Integrated transport planning</td>
<td>Planning which incorporates all forms of transport modes – public and private transport, and all forms of motorized and non-motorized transport.</td>
</tr>
<tr>
<td>Low-carbon transport</td>
<td>Transportation means which use no or limited amounts of fossil fuels, preferably rather new or renewable energy sources. This could include the use of electricity generated through non-fossil sources (hydro-power, wind energy, gas, solar power).</td>
</tr>
<tr>
<td>Non-motorized transport</td>
<td>Walking or cycling.</td>
</tr>
<tr>
<td>Mass transit</td>
<td>All form of public transport.</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Reduction of green-house-gas emissions from carbon-driven private vehicles or public transport.</td>
</tr>
<tr>
<td>Mobility management</td>
<td>Monitoring and supervision of all forms of transport modes – public and private transport, and all forms of motorized and non-motorized transport. Monitoring is done through GPS or Closed circuit television (CCTV).</td>
</tr>
<tr>
<td>Sustainable transport</td>
<td>This represents a combination of low-carbon transport with integrated transport planning.</td>
</tr>
<tr>
<td>Transit-oriented development (TOD)</td>
<td>TOD is a planning technique which bundles densities near urban transit hubs, and generates real estate development opportunities which are banking on high density and mixed land-use. TOD is often used to generate revenues for public agencies which develop TOD projects through public-private partnerships. Such revenues can be utilized to finance and cross-subsidize other non-revenue earning developments.</td>
</tr>
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</table>
1 THEMATIC BACKGROUND

Transport problems exemplify the state of cities. Congestion, low-quality public transport, inconvenient non-motorised transport and high level of noise and air pollution are the very visible adverse effects of urban transport in many European and Chinese cities. Less visible but equally daunting are the constantly growing CO₂ emissions from the transport sector both in China and in Europe. In Europe the deterioration of the quality of life in cities has sparked a discussion on the compatibility of a liveable city and car centred infrastructure since the late 1970ies. A discussion that is more and more emerging in China as well - not least due to the rapid on-going decline of air quality in China’s megacities.

Motorization of private transport. China has experienced high growth numbers in motor vehicle population over the past two decades, a trend that is to continue. The Chinese capital Beijing has the highest private car penetration of the country. Currently there are about 197 private owned cars per 1,000 citizens in Beijing. However, to date the motorisation rate is still comparatively low compared to Europe and the United States. With currently 77 private passenger cars per 1,000 citizens China (in large cities such as Beijing it goes up to 200 cars) neither reaches the numbers neither of the USA (786) nor Europe (483, Eurostat). These figures indicate that there is still a large growth potential which is confirmed by stock growth scenarios. Recent projections forecast a four to six fold increase in private passenger cars until 2030. This would add at least 250 to 450 million more cars to the already clogged streets of Chinese cities. Such a rapid increase in the vehicle population is putting high pressure on the energy and material resource demand in China. By 2013, the share of imported petroleum to total domestic oil consumption was up to 58% from 33% in 2000. Europe imports around 84% of its crude oil from abroad. In 2010, the EU’s oil import bill was around € 210 billion (Eurostat).

"Movement enables development. To undertake commercial exchange, access public services, or engage in recreation and entertainment, society relies upon the ability to move..."
persons, goods, or information from one location to another. The concepts of exchange and movement can be viewed as core elements in defining a city. Thus, mobility and accessibility are intertwined with development. And yet, paradoxically, transport conditions tend to worsen as economic development increases... Transport is the only major sector in which base conditions will tend to worsen as economic performance increases. As incomes rise so do levels of car and motorcycle ownership, which leads to heightened levels of congestion and the other problems associated with motorization. In the cities of the developing world, increased private motorization is tending to decrease exchange and accessibility. Developing-nation cities, though, are in a unique position to shape their form before a culture of motorization becomes fully established. Convincing individuals to leave their cars and motorcycles for alternatives is far more difficult and costly than retaining mode share of sustainable options through better quality. Instilling smart growth design principles into city expansion and maintaining public transport and non-motorized users through service quality are pro-active measures that are perishable in some ways if the opportunity is missed. Since major investments in road-based infrastructure are relatively irreversible over the medium term, decisions made by developing-nation officials today will likely determine the shape and direction of their future urban form.

Potential for progress through green transport. Technological leap-frogging refers to a process in which developing countries can bypass intermediate development steps and progress directly to more advanced technological options, i.e. to green development. With regard to urban transport, this process could infer a move directly to more sustainable transport options rather than committing to a predominantly auto-based urban form. Implicit in the case of Green Cities for developing nations is the idea that development and motorization can be decoupled. Sustainable transport options offer an alternative path for eco-cities. A complementary package of public transport, quality footpaths and cycle ways, vehicle-restriction measures, clean fuels, safety programs, and high standards can constitute a new paradigm for urban mobility and access."

Hierarchy of urban transport through an evolutionary process.

---

Sustainable transport refers to the broad subject of transport that is sustainable in the senses of social, environmental and climate impacts, and the ability to use the source energy indefinitely. Components for evaluating sustainability include the particular vehicles used for road, water or air transport; the source of energy; and the infrastructure used to accommodate the transport (roads, railways, airways, waterways, canals and terminals). Transportation sustainability is largely being measured by transportation system effectiveness and efficiency as well as the environmental and climate impacts of the system.

Transport impersonates the ills of cities. Arguably, no other sector attracts the amount of attention by residents than transport; everyone is affected in some way or another. Ailing or absent transport infrastructure makes daily activities in cities time consuming, inefficient and frustrating - negatively impacting productivity and human health. The advent of motorised transport and increases in personal wealth has seen many cities grind to a halt on account of inadequate investment and provision in transport.

As will be demonstrated by this Position Paper, transport planners have developed a myriad of planning approaches and new transport technologies to mitigate or overcome the traffic ills of today’s cities. But the criticism of today’s urbanism and city development model has lead some critiques to discuss the need for cars at all. This takes into consideration the drive to make cities more compact, with many civic and commercial activities bundled around public transportation hubs (transit-oriented development - TOD), and a surge in non-motorised transport through walking and bicycle use. Thus, could one imagine cities without cars? ²

Low-carbon transport. Low-carbon transport is supposed to enable economically viable infrastructure and operation that offers safe and secure access to transportation facilities for both persons and goods while reducing short and long term negative impact on the local and

global environment. The most practical approach to create sustainable cities is to influence the scale, location, and type of land development and its integration with transport. Without strong accessibility, there is no development, and thus the transportation network can be highly effective in guiding cities growth. Yet city authorities rarely deploy their resources to manage land or to develop roads as a way to manage growth. Efficient public transport reduces pollution and should be provided from the outset. The use of zero-emission vehicles and bicycles should be encouraged, and private cars should be kept out of city centers. To guide development, governments can construct infrastructure, particularly for water, transport, and housing. The first step, therefore, is to create links between planning and implementation. This requires a strong planning process that includes representatives from national and city governments, public works departments, major developers, and civil society. The second step is to develop area road networks (both arterial and secondary) in fringe area where development is desired. Design and construction guidelines in these areas should be consistent with the needs and means of future occupants, including low-income groups.

**Green House Gas emission.** Transport systems are major emitters of greenhouse gases, responsible for about 25% of world energy-related GHG emissions, with about three quarters coming from road vehicles. Currently 95% of transport energy comes from petroleum. Energy is consumed in the manufacture as well as the use of vehicles, and is embodied in transport infrastructure including roads, bridges and railways. The use of diesel seems on the way out, and gasoline powered cars may also follow.3

**Increasing importance of transport sector.** For both, China’s and Europe’s cities the transport sector is therefore a growing environmental, economic and social concern. This Position Paper provides an overview of a number of policies, technologies and innovations to reverse the trend of growing transportation related emissions.

It is widely recognized that the transportation infrastructure provided shapes travel behaviour. This has led to a shift from traditional transport planning (vehicle centered) to urban mobility planning (people centered) in many European cities. To undertake commercial exchange, access public services, or engage in recreation and entertainment, society relies upon the ability to move persons, goods, or information from one location to another. The concepts of exchange and movement can be viewed as core elements in defining a city. At the same time, the city structure determines our ability to be mobile. Thus, mobility and accessibility are intertwined with development. And yet, paradoxically, transport conditions tend to worsen with economic development. As income levels increase so do levels of car and motorcycle ownership, which leads to higher levels of congestion. A process that is very tangible in the megacities of China.

Cities are diverse in their current development state within - as much as between - Europe and China. Cities like Amsterdam (Netherlands), Berlin (Germany), and Tianjin (China) have a comparably low motorization rate and high share of non-motorised transport. Their policy-aim is mainly to maintain their current state which requires a different set of policies of cities that are currently in a stage of high motorisation like Beijing (China), Paris (France) and Rome (Italy). 4

At the same time there are cities in China that are currently in a paratransit dominant stage with a chance to leap-frog to a sustainable transport system while some cities are already

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experiencing full motorisation. However, cities do not only differ in their transportation system developmental stage, but also in terms of their institutional capacity and their socio-economic conditions.

Consequently, urban policy making requires a highly localised approach. The instruments discussed later will therefore present a wide range of successful policies that are suitable for different developmental stages in terms of the transport system and in terms of institutional capacity of city governments. However, it is essential to further consider the transferability of a policy given different socio-economical and institutional conditions.
2 DEVELOPMENT OBJECTIVES

Towards sustainable transport. All European countries use some variation of the Brundtland definition of sustainability — meeting the needs of the present without compromising the ability of future generations to meet their own needs — as the starting point for their efforts on sustainable development. CO₂ reduction, as called for in the Kyoto Protocol and other agreements, is an important objective for the European Union (EU) and for each of the member countries. In Europe, however, sustainability is seen as a much broader concept having economic and social as well as environmental dimensions. Sustainable development is viewed as development that improves service quality, the standard of living, and quality of life, while at the same time protecting and enhancing the natural environment and honouring local culture and history. It is being recognized transportation is a prime tool to help meet overall sustainability objectives. Attributes of sustainable transportation follow from the expanded definition of sustainable development: Sustainable transportation is safe, high quality, and accessible to all; ecologically sound; economical and affordable; and a positive contributor to regional development. Specific goals for sustainable transportation include improved service quality and quality of access to goods and services, safety, improved air quality, noise reduction, improved water quality, protection of habitat and open space, historic preservation, reduced carbon emissions, increased social equity, economic development, and a satisfying quality of life, plus local goals consistent with the overall objective.

Creating a sustainable transport system is a development objective in itself but requires further operationalization and definition of specific targets. A sustainable transport system has the following components (Bongardt, Creutzig et al., 2012).

1) **Environmental sustainability**: Protecting the climate, ecosystem, natural resources and public health
2) **Economic sustainability**: Creating an affordable, fair and efficient transport that supports economic activity and balances regional development
3) **Social sustainability**: allow access and development needs of societies to be met between and within generations

Reduction of environmental impacts. The environmental impacts of transport can be reduced by improving the walking and cycling environment in cities, and by enhancing the role of public transport, especially electric rail.

The greening of transport. Green vehicles are intended to have less environmental impact than equivalent standard vehicles, although when the environmental impact of a vehicle is assessed over the whole of its life cycle this may not be the case. Electric vehicle technology has the potential to reduce transport CO₂ emissions, depending on the embodied energy of the vehicle and the source of the electricity. The Online Electric Vehicle (OLEV), developed by the Korea Advanced Institute of Science and Technology (KAIST), is an electric vehicle that can be charged while stationary or driving, thus removing the need to stop at a charging station. The City of Gumi in South Korea runs a 24 km roundtrip along which the bus will receive 100 kW (136 horsepower) electricity at an 85% maximum power transmission efficiency rate while maintaining a 17 cm air gap between the underbody of the vehicle and the road surface. At that power, only a few sections of the road need embedded cables. Hybrid vehicles, which use an internal combustion engine combined with an electric engine to achieve better fuel efficiency than a regular combustion engine, are already common. Natural gas is also used as a transport fuel. Biofuels are a less common, and less promising, technology; Brazil met 17% of its transport fuel needs from bioethanol in 2007, but the Organisation for
Economic Cooperation and Development (OECD) has warned that the success of biofuels in Brazil is due to specific local circumstances; internationally, biofuels are forecast to have little or no impact on greenhouse emissions, at significantly higher cost than energy efficiency measures.

**Green Transport.** In practice there is a sliding scale of green transport depending on the sustainability of the option. Green vehicles are more fuel-efficient, but only in comparison with standard vehicles, and they still contribute to traffic congestion and road crashes. Well-patronised public transport networks based on traditional diesel buses use less fuel per passenger than private vehicles, and are generally safer and use less road space than private vehicles. Green public transport vehicles including electric trains, trams and electric buses combine the advantages of green vehicles with those of sustainable transport choices. Other transport choices with very low environmental impact are cycling and other human-powered vehicles, and animal powered transport. The most common green transport choice, with the least environmental impact is walking. Urban densities and the land use-transport linkages determine transport intensities required. Medium to high urban densities trigger reduce the need for trips, and if combined with intensive public transport, can reduce the need for individual, car based transport. A combination of car restrictions, use of non-motorized car use, and intensive public transport networks offers the right composition for low-urban carbon development. Transit-oriented Development (ToD) in combination with compact medium- to high-density urban development is beneficial for cities to rely less on private vehicular traffic. The resulting approach for the transport sector is known as Avoid – Shift – Improve.

**Three Elements of Low-Carbon Urban Development**

Sustainable transport instruments and their impact on carbon emissions embedded into the Avoid-Shift-Improve Framework Source Gomez, J. based on Dalkmann and Brannigan 2007

**Evolving strategy for sustainable transport.** A strategy to create a sustainable transport system is the avoid-shift-improve (ASI) approach. The ASI approach represents a renunciation of a supply-side dominated (e.g. road extension) transport planning approach and a move to a demand-side approach (e.g. mobility needs). The objective is to avoid trips and the distance travelled (indicator: VKT), to change the modal structure and encourage a shift towards low-carbon modes (indicator: VKT by mode) and to improve vehicle efficiency and fuels (indicator: carbon content, consumption). More on the widely recognized A-S-I approach can be found on the following websites:

- Sourcebook Urban Transport and Climate Change:

**Tool GT 1**

**Low-carbon transport and co-benefits.** While low-carbon transport development is the focus of this Position Paper it should be noted that the strategies and instruments described
in Figure 1 have the potential to create considerable added value called “co-benefits” beyond GHG emissions savings as described in Figure 2 below (in more detail see chapter 5.1)

**Figure 2: Co-Benefits of sustainable transport policies**

Considering benefits such as a reduction in external costs, an improved life quality, economic development and energy security can improves the feasibility and acceptability of policies (Strompen, Litman et al., 2012).

**How much space do people take up in different modes of transport? Cars, buses, trains, bikes or walking**

[Screen capture PTV Group]
3 KEY ISSUES --- KEY CONCEPTS

<table>
<thead>
<tr>
<th>Key issues to be addressed</th>
<th>Key concepts to be used</th>
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<tbody>
<tr>
<td>Less externalities:</td>
<td>Avoid strategy:</td>
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<tr>
<td>GHG emissions</td>
<td>Transit-oriented develop</td>
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<tr>
<td>Congestion</td>
<td>Integration of land-use and transport planning</td>
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<td>Air quality</td>
<td>Dense cities</td>
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<tr>
<td>Environment</td>
<td>Smart growth / mixed land-use strategies)</td>
</tr>
<tr>
<td>Road safety</td>
<td>Carsharing</td>
</tr>
<tr>
<td>Noise</td>
<td>Shift strategy:</td>
</tr>
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</table>

**Stronger economic development:**

| Time savings              | Non-motorised transport |
| Creation of local jobs    | Public transport        |
| Relocation of human resources to liveable cities | Parking management |
| Access to services /jobs /markets /education | Pricing instruments |
| Private investments and encouragement of relocation to liveable cities | Intermodality |
| Affordability              | Carsharing              |

**Better energy security:**

| Imported fuels              | Improve strategy:       |
| Energy costs                | Electric mobility       |
|                             | Low-resistance tires    |
|                             | Fuel economy standards  |
|                             | Fuel pricing            |
|                             | Alternative fuels       |
|                             | Fuel quality standards  |
| Improved productivity of cities | Six D’s (destinations, distance, design, density, diversity, demand, demand management) |
| Mass transit                | Non-motorized transport |
| Assess to land              | Energy efficiency and alternative fuels |
| Development concessions linked to transport planning | Intelligent transport systems |
| Affordability               | Smart cities – smart transport management |
4 PERSPECTIVES FROM EUROPE

4.1 Sector Context and Policy Analysis

A brief introduction transport policy und urban planning in Europe. There are major differences in transport energy consumption between cities; an average U.S. urban dweller uses 24 times more energy annually for private transport than a Chinese urban resident, and almost four times as much as a European urban dweller. The average distance travelled by car by an American is twice as long as the distance travelled by a European. In Germany, for example, 24% trips are made by walking. These differences cannot be explained by culture and economic development alone but to enduring features of the city including urban density and urban design. The cities and nations that have invested most heavily in car-based transport systems are now the least environmentally sustainable, as measured by per capita fossil fuel use. The social and economic sustainability of car-based urban planning has also been questioned. The comparatively high energy efficiency of European cities can be explained by a long history of integrated urban and transport planning.

Paris, France has Approved in 2017 a City-wide Strategy for Peatonalisation

The basic principles of planning cities in the 20th century were laid through the Athens Charta in 1933. However in Europe most of these guidelines came only into use after the end of the Second World War. Even though the results in appearance may differ among Western European countries, the underlying planning principles were overall similar. The 1950s marked the beginning of a rapid individual motorisation, letting planners apply principles of car oriented developments. For both new suburban and inner city developments the idea of uninterrupted flowing car traffic with the least amount of intersections to grant quick access to the destination on highway-like roads became the heart of urban planning. The underlying idea was to meet the demand of traffic by increasing the supply in infrastructure. In the suburbia new developments were planned to be fast and easily accessible through trunk roads. In the inner cities it resulted in the construction of car parks, subways, multi-lane roads and elevated highways separating quarters and communities which made inner cities often...
less pedestrian friendly. The underlying principle was a separation of functions i.e. different zones for commercial activities, industry, leisure and residential functions.

However, planners recognised that the new infrastructure supply and separation of function by itself created again more demand and resulted in even more traffic growth. The separation of the city into different zones resulted in the necessity to commute from residence to work. Already since the 1970s mainstream transport planning in Europe has rejected the assumption that the private car was the best or only solution for urban mobility. For example the Dutch Transport Structure Scheme has since the 1970s required that demand for additional vehicle capacity only be met "if the contribution to societal welfare is positive", and since 1990 has included an explicit target to halve the rate of growth in vehicle traffic.

Especially from the 1980s onwards planning policies answered the ever increasing traffic and the resulting environmental issues. The new approach was to integrate the various bodies involved in creating urban and traffic planning policies. Also the car centred policy approach was replaced by a more equal one towards all traffic participants – including non-motorised and public transport. Policies to counter the suburbanisation and making the inner cities again more attractive were introduced to increasing the population densities and to reduce commuting times. However overall increased mobility in the society created more demand for roads and other infrastructure, hence new policy guidelines beginning with the late 1990 try to establish sustainable planning solutions to the growing issues of urbanisation and mobility. European cities nowadays tend to allow a greater mix of uses in their residential zones, thus keeping trip distances shorter. A higher density allows public transit to operate at a much higher efficiency level and also makes non-motorised transport more attractive.

**Current State of Urban Transport in Europe.** 欧洲目前的城市交通状况. Cars are the most popular passenger mode across the European Union: they represent some 72% of all passenger kilometres. However, the private car is rarely the most energy-efficient form of transport. According to data from the UK, 60% of cars have only one occupant. The percentage increases to approximately 85% for commuting and business trips (Statistical Pocketbook 2010).
EU Transport Scoreboard

The comprehensive database provides statistics for each member state related to transportation. The data provided includes modal splits, transport expenditure, GDP, population.

Transport in Figures – Statistical Pocketbook 2013

This publication provides an overview of the most recent and most pertinent annual transport-related statistics in Europe. It covers the European Union and its 28 Member States and, as far as possible, the current EU acceding and candidate countries and the EFTA countries.

Whether environmental considerations make it into transport policy making highly depends on the public acceptability. Current surveys show that European consumers are willing to make changes to reduce emissions. The majority of car users (66%) say they would compromise on a car’s size in order to reduce emissions and 62% say the same about the car’s range—i.e. the distance driven before needing to refuel a combustion engine or recharge an electric vehicle. More than half (60%) would also be willing to pay more for their car if this helped reduce emissions. A key strategy in the White Paper on Transport is investments in public transport. Public transport quality and connections need to be greatly improved if consumer behaviour is to change. A large majority (71%) of car users feel that public transport is less convenient than the car. A similar proportion (72%) says they do not use public transport because of a lack of connections. 64% blame too few services and 54% mention lack of reliability (Source: [http://ec.europa.eu/public_opinion/flash/fl_312_en.pdf](http://ec.europa.eu/public_opinion/flash/fl_312_en.pdf)).

A large majority of European citizens live in an urban environment, with over 60% living in urban areas of over 10,000 inhabitants. They live their daily lives in the same space, and for their mobility share the same infrastructure. Urban mobility accounts for 40% of all CO₂ emissions of road transport and up to 70% of other pollutants from transport.

European cities increasingly face problems caused by motorised transport. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge to all major cities in Europe. Congestion in the EU is often located in and around urban areas and costs nearly 100 billion Euro, or 1% of the EU’s GDP, annually. (Source: DG Move). Cities themselves are usually in the best position to find the right responses to these challenges, taking into account their specific circumstances. Efficient and effective urban transport can significantly contribute to achieving objectives in a wide range of policy domains for which the EU has an established competence. The success of policies and policy objectives that have been agreed at EU level, for example on the efficiency of the EU
transport system, socio-economic objectives, energy dependency, or climate change, to a large extent depend on actions taken by national, regional and local authorities.

Key Facts on Transport in Europe 欧洲交通的主要方面

- **Transport greenhouse gas emissions**, including from international aviation and maritime transport, increased by around 34% between 1990 and 2008. Over the same period, energy industries reduced their emissions by about 9%. Source: [http://eea.europa.eu/](http://eea.europa.eu/)
- Transport is responsible for about a quarter of the EU's greenhouse gas emissions. 12.8% of overall emissions are generated by aviation, 13.5% by maritime transport, 0.7% by rail, 1.8% by inland navigation and 71.3% by road transport (2008). Source: [http://eea.europa.eu/](http://eea.europa.eu/)
- The transport industry directly employs more than 10 million people, accounting for 4.5% of total employment, and represents 4.6% of Gross Domestic Product (GDP). Manufacture of transport equipment provides an additional 1.7% GDP and 1.5% employment. Source: [http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home](http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home)
- The public transport sector employs 2 million people in the EU. Source: [http://www.uitp.org/key-eu-statistics](http://www.uitp.org/key-eu-statistics)
- Public transport services contribute around 1.2% to GDP while road congestion costs GDP 1% per year. Source: [http://www.uitp.org/key-eu-statistics](http://www.uitp.org/key-eu-statistics)
- 13.2% of every household's budget is spent on average on transport goods and services. Source: [http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home](http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home)
- In the EU, transport depends on oil and oil products for more than 96% of its energy needs. Source: [http://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2010_en.htm](http://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2010_en.htm)


The objectives of the EU White Paper on Transport Policy 欧盟交通政策白皮书中列举的目标. The proposals in the White Paper will dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050. By 2030, the goal for transport will be to reduce GHG emissions to around 20% below their 2008 level. Given the substantial increase in transport emissions over the past two decades, this would still put them 8% above the 1990 level.
By 2050 the following objective should be achieved:

— No more conventionally-fuelled cars in cities.
— 40% use of sustainable low carbon fuels in aviation; at least 40% cut in shipping emissions.
— A 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.
— All of which will contribute to a 60% cut in transport emissions by the middle of the century.

In recent years, EU policy and legislation relevant to urban mobility has been developed. Significant funding has been provided through the Structural and Cohesion Funds. EU-funded initiatives, often supported by the Framework Programmes for research and technological development, have helped to develop a wealth of innovative approaches. EU-wide dissemination and replication of these approaches can enable public authorities to achieve more, better and at lower cost. The EU can also help authorities to find solutions that are interoperable and facilitate smoother functioning of the single market. Agreeing standards for the whole of the single market enables larger volume production, lowering the cost for the customer. The EU has therefore developed an Action Plan on Urban Mobility. 

The following topics are covered in the Action Plan:

1) Promoting integrated policies
2) Focusing on citizens
3) Greening urban transport
4) Strengthening funding
5) Sharing experience
6) Optimising urban mobility

These themes are translated into a number of innovative urban transport projects that pilot innovative technologies and policies. The projects are introduced in the chapter on best practices.


Key for a successful transport planning is a comprehensive and integrated planning approach. The following figure shows the “Ten Principles of Urban Transport Planning” which will guide the Position Paper in Chapter 4.1. An English version of the figure can be found here: http://www.sutp.org/news-archive-mainmenu-156/sutp-news-mainmenu-155/4265-10-principles-for-sustainable-urban-transport-translate-it-into-your-national-language

An illustrated version of the principles can be found here: https://prezi.com/7ufnp8crzc11/10-principles-sut/
Figure 3: Ten Principles of Urban Transport Planning

可持续交通的十项原则

原则1：规划密度计人文尺度
原则2：交通导向型发展
原则3：优化道路网络及使用
原则4：改善交通服务质量
原则5：鼓励步行和自行车
原则6：控制车辆使用
原则7：停车管理
原则8：推广清洁车辆
原则9：交流解决方案
原则10：面对挑战的综合对策
EU policy. At the core of the European Union’s strategy for transport in Europe is the 2011 White Paper on Transport which sets the way for a single European transport area and a competitive and resource-efficient transport system (White Paper: [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN](http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN)). The main goal of the White Paper is to disconnect mobility from its adverse effects. This means, above all, promoting co-modality, i.e. optimally combining various modes of transport within the same transport chain. ➔ Tool GT 1


Based upon the results of the consultation process, the European Commission adopted the "Action Plan on urban mobility" in 2009 which introduced the “Civitas” initiative. The initiative promotes the development of urban level sustainable transport action plans. The preparation and implementation of such plans were supported since 2010 through the ELTIS Plus project (the projects are described in the Position Paper in Chapter 4 in more detail). The "Civitas" initiative is also supporting demonstration projects of clean and energy-efficient vehicles, like the European Green Cars initiative. The European Green Cars initiative is based on the EU directive (for EU member countries) on the promotion of clean and energy-efficient road transport vehicles, as outlined in the 2011 White Paper on Transport.

### Transport Policy and Legislation in Europe

The White Paper is the most important policy document guiding the transport sector in Europe. Its comprising of 40 initiatives designed to generate growth, jobs, reduce dependence on imported oil, and cut the sector’s carbon emissions by 60% by 2050.

A number of legislations are governing the sector. All legislative transport related documents can be found here:

The EC Urban Mobility Package 欧盟城市交通包. The European Commission adopted the Urban Mobility Package in 2013 to further encourage a shift towards cleaner and more sustainable transport in urban areas. The initiative tackles urban mobility challenges by

- Sharing experience, show-casting best practice and fostering cooperation
- Providing targeted financial support
- Focussing on research and innovation to deliver solutions for urban mobility challenges
- Involving the EU member states and enhance international cooperation

The concept of sustainable urban mobility planning is a key area in the Urban Mobility Package alongside urban logistics, urban access regulations, deployment of intelligent transportation systems in urban areas and urban road safety.  

More information on sustainable urban mobility planning in Chapter 4.1.2 and 4.1.3.

Integrated Urban and Transport Planning: Sustainable Urban Mobility Plans (SUMP) 综合城市和交通规划：可持续城市出行方案.

At the end of a comprehensive consultation and review process, the European Commission has translated the widely advocated paradigm of integrated urban land-use and transport planning into a practical concept: Sustainable Urban Mobility Plans.

The idea behind the concept is to avoid planning transport in silos of administrations, modes or expertise. In practice this means that urban transport planning and land-use planning should be integrated, that modes should be developed in a balanced manner and that people and not traffic are the planning subject.


- Ensure all citizens are offered transport options that enable access to key destinations and services;
- Improve safety and security;
- Reduce air and noise pollution, greenhouse gas emissions and energy consumption;
- Improve the efficiency and cost-effectiveness of the transportation of persons and goods;
- Contribute to enhancing the attractiveness and quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole

The process of developing SUMPs is as important as the plan itself. A thorough discussion of the city development and mobility targets as much as possible solutions and measurements
(for different scenarios) is crucial during a cross-departmental including public stakeholder.

More on the Sustainable Urban Mobility Plans can be found in Chapter 4.1.3.

**Bremen wins the 2014 Sustainable Urban Mobility Plan (SUMP) Award that recognizes excellence in sustainable mobility** (Source: www.sutp.org)

On 23 March 2015, the European Commissioner for Transport, Violeta Bulc, presented two prices for innovation in urban mobility at the European Mobility Week – SUMP Award ceremony in Brussels, Belgium. Out of the 17 applicants from 10 EU countries, Bremen (Germany), Dresden (Germany) and Ghent (Belgium) were announced as finalists, with Bremen winning the SUMP award. With a different theme every year, the 2014 award focused on cities that have shown excellent monitoring and evaluation of both the planning and implementation of their SUMP. Bremen’s imaginative and systematic approach to monitor and evaluate progress in sustainable urban mobility, including an interactive web platform to obtain feedback from residents, impressed the judges. In particular, Bremen’s ability to learn and communicate these lessons effectively to stakeholders was highly praised.

Find out more about the award and the award winning city:
City of Bremen: [http://www.bremen.de/home](http://www.bremen.de/home)

**Transferability of urban transport policy China/Europe** 中欧之间城市交通政策的互换性.
The idea of a Position Paper is learn from each other’s policies success and failures. Policies have to be considered in a regional context. Sweden, Germany, the Netherlands and the United Kingdom were identified as nations that have been actively addressing sustainable transportation issues for several decades. Key differences include slower growth than in China’s metropolitan areas, relatively homogeneous population size, and more extensive and more heavily utilized transit systems. Similarities are the growing auto ownership and use, suburban development, and public interest in community amenities and quality of life. European practice frequently matches operating responsibility for transit and highway systems with control over funding for those systems, and often assigns such responsibility and control to local or regional agencies. This can be seen as a logical extension of policies related to the integration of connectivity of transportation systems, across and between modes, for people and freight.

Planning approaches that might be adopted in China include visioning processes to develop shared goals, strategic planning for both the long-term and mid-term, and backcasting to test to see what strategies would be needed to meet goals. Another policy item with high potential is the use of performance standards along with monitoring and reporting on progress. This
Policy could be coupled with fiscal incentives for actions supportive of adopted goals. Of particular interest to team members are car-sharing and projects aiming to educate the public about the costs of driving, as well as the possibilities for joint development to help pay for expensive but socially and environmentally attractive project designs. There is considerable interest in the strategic use of new technologies for the advancement of sustainable development goals, and for creative designs using biotechnologies, recycled materials, and other context-sensitive approaches to build and rebuild transportation infrastructure that better fits its environment.

Figure 4: The five possible intervention areas for sustainable transport planners

For most of these policies best practices are provided in the following chapters.

4.2 Position Paper and Best practices

Transferability of Sustainable Urban Transport Solutions
可持续城市交通方案的可转移性

The SOLUTIONS project abandons the assumption that the provision of technical information on urban transport policy is enough to apply the policy in different contexts. Given different institutional capacities and socio-economic circumstances the project aims at analyzing the transferability of successful policies and measures. The project is divided into leading cities and take-up cities. Take-up cities test and document the feasibility of policies that were successful in leading cities. The project analyses barriers and success factors for the transferability of policies in the following clusters: Public transport, infrastructure, city logistics, integrated planning, mobility management and clean vehicles.

Resources and Tools: 资源和工具

E-Learning courses: 网上学习课程
The training material is provided by the Ruprecht Academy. The training is divided into 6 modules:
1. Sustainable Public Transportation
2. Transport Infrastructure
3. City Logistics
4. Sustainable Urban Mobility Plans
5. Network Management
6. Clean Vehicles
Link E-Learning Solutions http://www.ruprecht-academy.eu/

Guidelines, Case Study: 导则、案例集
The EU Niches project also worked extensively worked on the transferability of innovative urban transport solutions. An output of the projects are guidelines for assessing the transferability of innovative urban transport concepts.

The TIDE project provides urban transport professionals with two handbooks that can help manage and reduce the risk of starting something new. The handbooks aim to increase local authorities' knowledge enabling them to fully understand the barriers, drivers and risks of innovation in urban transport. Link Systematic transfer methodologies.
Study Tour Catalogue

The featured cities in this catalogue have been selected by urban transport experts within the scope of the EU funded projects NICHES and NICHES+, which studied and promoted a range of innovative sustainable transport approaches within a number of thematic areas, such as accessibility, infrastructure and interchanges, traffic management, automated and space-efficient transport systems, urban freight etc.

### 4.2.1 Integrated planning 综合规划

A. Planning dense and human scale cities 规划高密度、人性化尺度的城市

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Planning dense and human scale cities 规划高密度、人性化尺度的城市</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td><strong>Avoid/Shift</strong></td>
</tr>
<tr>
<td></td>
<td>The basis of this planning principle is to reduce automobile dependency through reducing the spatial distance of work place, residence, local supply, services, education and leisure activities. Further it aims at creating an urban transport design that prioritises human-scale modes, a small urban fabric and mixed use city centres. It was designed to create a planning principle countering the issues of urbanisation and foremost urban sprawl, such as long distance commuting and land consumption. For achieving more sustainable patterns, a set of measures may be used, such as mixing land usage, making distances walkable and areas pedestrian friendly, promoting attractive communities and especially involving local communities and stakeholders in the decision making and planning process. As the foremost principle of this policy it should achieve an effective and reasonable accessibility to an area, which usually involves promoting non-motorised transportation, such as walking or cycling, instead of private car usage. Other policy measures include the creation of affordable housing opportunities, development of urban sub-centres, and prioritisation of human-scale modes.</td>
</tr>
</tbody>
</table>

#### Examples 案例

<table>
<thead>
<tr>
<th></th>
<th>Freiburg (German) Case 1: Freiburg Charter – Urban development and planning for the future</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The policy recommendation uses the experiences of planning in Freiburg to give general guidelines on developing sustainable cities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Case 2: Helsinki, Finland - Urban Design for Sustainability: Learning from Helsinki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The paper gives examples generally on planning Finland and planning principles and concentrates in its case study part on the two quarters of Viikki and Pikku Huopalahti</td>
</tr>
<tr>
<td></td>
<td>Online: <a href="http://nrl.northumbria.ac.uk/15327/">http://nrl.northumbria.ac.uk/15327/</a></td>
</tr>
</tbody>
</table>
Case 3: London, United Kingdom - Towards a More Compact City

The paper gives a brief overview on the intended strategies in London for creating the planning basis on sustainable urban growth.

Online: [www.isocarp.net/data/case_studies/442.pdf](http://www.isocarp.net/data/case_studies/442.pdf)

### Resources

#### Compact City Policy

After a brief overview of compact cities and planning policies, the paper demonstrates through case studies its application in Amsterdam, Copenhagen and Hamburg.


#### Compact City Policies – A Comparative Assessment

This report summarises current policies and evaluates outcomes across the OECD. It gives recommendations on implementation and highlights the challenges that decision-makers face. Furthermore it gives best practice examples.


#### Spatial and transport planning integrated policies

Guidelines for northwest Spain

The working paper gives an overview on applied and intended integration of urban and transport planning for the region of northwestern Spain.

Online: [http://www.tsu.ox.ac.uk/pubs/1034-salas-olmedo.pdf](http://www.tsu.ox.ac.uk/pubs/1034-salas-olmedo.pdf)
UN-HABITAT – Planning and Design for sustainable urban mobility

Chapter 5 of the book highlights the necessity of integrating urban and transport planning to create sustainable cities. It uses worldwide examples and comparisons and shows how uncontrolled growth creates persistent traffic problems. It advises on planning cities in an accessible way, gives guidelines and displays examples on best practice.


Barcelona opening the first ‘super-block’ to its pedestrians and cyclists

In 2016, the city of Barcelona started to measures to reduce traffic in central urban areas aimed at better livability in the central high density neighbourhoods.


Paris, France: A pedestrian zone to be created along the Seine

“Mayor Anne Hidalgo is pushing for the transformation of 3.3 kilometers (2 miles) of highway along the Seine into a pedestrian zone against the famous backdrop of central Paris. What may sound like a dream for tourists might well become a nightmare for drivers. As many as 43,000 cars per day will have to find other routes though the French capital. The Socialist Party calls it ‘taking back the banks of the Seine.’ The Paris city council is to vote on the proposal on September 26. A majority is expected to back Hidalgo's plan.

There have already been many trial runs for the new pedestrian zone on the Seine's right bank: for a few weeks every summer, this stretch is closed to traffic for the event "Paris Plages," or Paris Beaches. Salsa rhythms echo across the Seine as Parisians sip aperitifs on converted wooden
palettes beside the bar ship. A few meters farther on, a family plays at boules, and teenagers lounge in beach chairs. The section of road along the Seine’s left bank was closed in 2013. In an interview with broadcaster French Inter, Hidalgo insisted that both traffic and air pollution had decreased as a result. Altogether, 5.5 million euros ($6 million) were earmarked to re-landscape the former highway.

Hidalgo's policies of limiting space for cars while encouraging use of public transportation and bicycles are in keeping with current trends. "All the world’s cities are moving in the same direction. And I don't want to see Paris lagging behind."

### Illustrations

**Picture:** "Solar ship in the Vauban area of Freiburg im Breisgau in Germany" by "Mangan02"

Source: Licensed under CC BY-SA 3.0 via Wikimedia Commons

**Picture:** "Latokartano residential area in Viikki, Helsinki, Finland" by Jonik

Source: Licensed under CC BY-SA 2.0 via Wikimedia Commons

### B. Transit-oriented development (TOD 开发)

<table>
<thead>
<tr>
<th>Policy/</th>
<th>Transit-oriented development</th>
</tr>
</thead>
</table>

Urban transport planning is very multifaceted and urban mobility solutions need to be multi-dimensional in nature. It needs a complete and holistic approach requiring a combination of supply side and demand side measures. Good urban transport planning should be more than providing engineering solutions and needs to consider other aspects such as land-use planning, traffic management, affordability etc. It is important to fully understand the linkages among these different dimensions. One form of integrated transport and land-use planning is transit-oriented development which is a mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighbourhood. These neighbourhoods have maximized access to public transit services. Within transit-oriented development the expanding development of urban areas runs along the public transit axes. Thus, an efficient performance and utilization by public transit services is guaranteed and attain a large number of people. The accessibility of urban infrastructure is an attractive incense to use public transit services and as a result soil and building lots are most valuable near transit stations. To counteract this effect, urban planner can conduct area zoning in these regions. The prescribed use of an area density is higher, the closer it is to the public transit station. As the city development occurs along corridors, free space between these will be created, which can be used for example for recreation forms. Inhabitants will live in close proximity to green spaces.

Example:

**Case 4: Copenhagen “Fingerplan”**

Within this plan the further expanding and development of Copenhagen’s urban area runs along the public transit axes. This ensures that people are always able to access to open space, parks and undeveloped, natural areas on a regional scale.


**Case 5: Berlin Integrated Urban Planning**

The Urban Transportation Development Plan was drafted in a consultative process and provides the roadmap for Berlin’s transportation policy, and forms today’s framework for concrete transportation planning and measures on all levels across the city.
### Training

The CIVITAS High Level Training Workshop on Integrated Planning provided the participants with a thorough understanding of integrated planning as a means to better manage transport in cities. Using real life experiences (with the Gent and Nantes case studies), it substantiated the need for integrated planning, providing insights in the planning and operational process, and presenting the tools presently at hand.

**Training material:**
http://www.eltis.org/resources/training/integrated-planning

### The Equitable Development Toolkit

The Equitable Development Toolkit provides tools that varying stakeholders can use to achieve diverse, mixed-income Neighborhoods that provide access to opportunities for employment, education, affordable housing, and health and well-being. The tools provide strategies to reduce economic and social disparities among individuals, social groups, neighborhoods, and local jurisdictions across metropolitan regions. These strategies include policy changes that promote mixed-income communities, benefit all community residents, and strengthen metropolitan regions.

**Toolkit:**

### Land Use Planning Thematic Research Summary

The CIVITAS High Level Training Workshop on Integrated Planning provided the participants with a thorough understanding of integrated planning as a means to better manage transport in cities. Using real life experiences (with the Gent and Nantes case studies), it substantiated the need for integrated planning, providing insights in the planning and operational process, and presenting the tools presently at hand.

**Link:**

**Workshop Presentations and Studies:**
http://www.eltis.org/resources/training/integrated-planning

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**Download:** [http://sustainabletransport.org/publications/](http://sustainabletransport.org/publications/)

**City Senate:** [http://www.stadtentwicklung.berlin.de/verkehr/index_en.shtml](http://www.stadtentwicklung.berlin.de/verkehr/index_en.shtml)

**Case 6: Nantes, France**
http://www.eltis.org/sites/eltis/files/Rouleau_Tiraoui_Nantes_case_study0_1.pdf
**Transplus**

Case: Transplus is an EC supported project under the 'City of Tomorrow and Cultural Heritage' key action, which is one of the four key actions under the European Commission's Energy, Environment and Sustainable Development research programme. This key action aims to address challenges of urban air quality, noise, traffic congestion, waste, economic competitiveness, employment, security, infrastructure and the built environment.


**PROPOLIS**

Case: Propolis aims to develop strategic approaches and methodologies in urban planning towards sustainable urban transport. The PROPOLIS project has shown that it is possible to use urban land use and transport models as a platform for producing urban environmental, social and economic sustainability indicators that can be used in assessing policy options. The research has demonstrated what types of policies are likely to produce positive results and has highlighted areas in which further work would be fruitful.


Contact: Mr Kari Lautso  kari.lautso@ltcon.fi

**Spatial and Transport Planning Integrated Policies. Guidelines for Northwest Spain**

This paper describes the coherence between land-use and integrated transport planning policies. It gives an explanation about the existing spatial strategies of urban development and a brief description of the study area in order to understand the key objective of this paper: to suggest some guidelines to Northwest Spain spatial strategies through the integration of land use and transport policies.

This paper describes five recent developments in Turin, Milan and Genoa in Italy, and Stuttgart and Hamburg in Germany were studied in terms of the density and parking requirements allowed or required by the respective city. The cities were chosen to be comparable to the U.S. experience in terms of being former industrial cities undergoing redevelopment and also being relatively auto-oriented.

Lessons learned from five case studies of Italian and German Transit-Oriented Developments:

Illustrations

Picture: The city of Bern (Switzerland) provides high accessibility of urban centres through tram systems while creating a liveable environment through pedestrian zones
Source: Daniel Bongardt
Picture: Zuerich (Switzerland). Allowing public transport in mixed land-use pedestrian zone increases accessibility without a major impact on walkability in urban centres.
Source: Daniel Bongardt
C. Financing Mass Transit with Land Value Capture

<table>
<thead>
<tr>
<th>Policy/Measures/政策/手段</th>
<th>Financing Mass Transit with Land Value Capture/用地价盈余平衡公共交通支出</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description and impact/内容和影响</strong></td>
<td><strong>Shift</strong>/<strong>Shift</strong></td>
</tr>
<tr>
<td></td>
<td>The value of property is mainly determined by its location. Being located to any form of public transport or mass transit increases accessibility and thus value of property. If a new tram, BRT or railway is build, the surrounding area becomes more attractive for investors. The benefits, that are indirectly given to land owners, land lords and investors can be utilised to finance the public transport systems extension overall. Mechanisms for capturing the increased value may be either taxation for property owners, businesses or spatially delimited areas recurrently or as a one-time payment for development rights. Land value capture is ideally used to encourage the private sector to contribute their share in infrastructural developments. It can be used to relief the city or municipality of the high burden of capital investments. Furthermore it may be a measure to achieve a more sustainable way of infrastructure development and can encourage transit-oriented development.</td>
</tr>
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<thead>
<tr>
<th>Examples/案例</th>
<th>Case 7: London, United Kingdom - London Crossrail</th>
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<tbody>
<tr>
<td></td>
<td>Chapter 7 of the PWC-study focusses particularly on value capture. Case Study: <a href="https://www.pwc.co.uk/en_UK/uk/capital-projects-infrastructure/assets/crossrail-2-funding-and-financing-study.pdf">https://www.pwc.co.uk/en_UK/uk/capital-projects-infrastructure/assets/crossrail-2-funding-and-financing-study.pdf</a></td>
</tr>
<tr>
<td>Case 9: Copenhagen, Denmark- Copenhagen metro and Ørestad development scheme</td>
<td>The article examines, besides those in Hong Kong, the experiences of Copenhagen where efforts have been made to exploit increase in land values for transport developments. Case Study: <a href="https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/3418/1/enoch_tec_land_value_gains_fund_public_transport.pdf">https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/3418/1/enoch_tec_land_value_gains_fund_public_transpo rt.pdf</a></td>
</tr>
</tbody>
</table>
**Resources**

|---|
| The document comprises an extensive list of resources and examples about financing transport developments through measures of land value capture.

| Case Studies: Regional Plan Association/VREF – “Location Value Capture Opportunities for Urban Public Transport Finance”
|---|
| The paper summarises the experiences and plans of different measures of location value capture from several cities around the world, including Paris and London.

| Urban Land Institute – “Value Capture Finance - Making urban development pay its way”
|---|
| The report summarises different ways of financing public transport and urban developments through value capturing.
Illustrations

Picture: "Canary Wharf Crossrail Station August 2013" by "Egriffin"
Source: Licensed under CC BY-SA 3.0 via Wikimedia Commons

Picture: "Øresund Station at the Copenhagen Metro, Denmark" by “Peter Brodersen”
Source: Licensed under CC BY-SA 3.0 via Wikimedia Commons
D. Sustainable urban mobility plans

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Sustainable urban mobility plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Shift/Fuel</td>
</tr>
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</table>

As a long term policy, sustainable urban mobility plans should integrate different fields surrounding urban and mobility planning, thereby achieving shifts towards sustainable transport modes. The particular goal is to reduce the necessity of using means of individual motorised transportation and thus to reduce the consumption of fossil fuels, pollution and effects on congestion.

The underlying principle is to develop urban transport systems that include all participants and thereby balance the various demands and needs of traffic participants, such as citizens, businesses and industries. Measures to achieve shifts in transport patterns may include promoting cycling and walking, improving and encouraging the use of public transport, fostering cleaner vehicles in the private and public sector as well as overall implementing policies permitting the use of motorised transport in the city. By integrating various groups of the society as well as vertical and horizontal integration of relevant bodies, the general impact may result in the implementation of policies that create a better economic viability, social equity and greater environmental effectiveness.

Examples 案例:

**Case 10: United Kingdom - Leeds Local Implementation Plan and Transport Strategy 2011 to 2026**


**Case 11: Berlin, Germany - Participation in developing the Berlin Transport Strategy Report**

[https://sustainabledevelopment.un.org/content/documents/3708kunst.pdf](https://sustainabledevelopment.un.org/content/documents/3708kunst.pdf)

**Case 12: Germany - Sustainable Urban Mobility Planning**

The Mobility Plans portal provides a wealth of information on how to develop and implement a SUMP, including:

- Information about the elements of a SUMP;
- Guidelines on the process of developing and implementing a SUMP;
- Selected tools, guides, handbooks and reports to support urban mobility professionals in their work;
- Case studies that analyse selected local examples of the development and implementation of mobility plans;
- A database on the involvement of cities in EU activities related to sustainable urban mobility planning.

The EC Guideline on Sustainable Urban Transport Plans.


Online: [http://www.eltis.org/mobility-plans](http://www.eltis.org/mobility-plans)

The report gives an overview over mobility plans in Europe and assesses the status quo of sustainable urban mobility planning and its impact. Based on this evaluation it gives an overview over different policy design options.


The Ch4allenge website provides free online courses about developing and implementing Sustainable Urban Mobility Plans (SUMPs). The target groups are people working in the field of urban mobility. Further detailed studies on participation, cooperation, measures selection and monitoring and evaluation available.

Technical paper: [http://www.sump-challenges.eu/content/participation](http://www.sump-challenges.eu/content/participation)

Online courses: [http://www.sump-challenges.eu/content/ch4llenge-online-learning-launched](http://www.sump-challenges.eu/content/ch4llenge-online-learning-launched)
Urban Mobility Plans – National Approaches and Local Practice

The publication reviews urban mobility planning approaches from various countries and provides policy makers with a valuable framework to shape national framework for urban transport planning.


List of European projects and guidelines:

Bump – Boosting Urban Mobility Plans


Illustrations 图片:

Picture: A rapid-transit bus (left) besides a conventional double storey bus on a street in Leeds. By “Rept0n1x” Source: Licensed under CC BY-SA 3.0 via Wikimedia Commons
E. Participation in planning

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Participation in planning 参与规划</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td>Participatory planning involves the entire or parts of the community in particular processes of urban and regional planning. It aims to harmonize different opinions of community residents, to avoid conflicts and to satisfy the public demand for participation. The strategic and management processes of urban planning of participation use different kind levels of codetermination. These range from direct co-decision to non-binding consultation in planning issues. This intends to identify local conflicts before the planning process is completed. In addition the participation process shall help to better response to the needs of local population. For this purpose informal and formal participation methods are developed. In this connection informal agreements have no legal base and are only a recommendation for planning processes. In contrast formal agreements must be taken into consideration and have to implemented by policy-makers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples 案例</th>
<th>Case 13: Berlin, Germany - Tempelhof Freiheit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Case 14: Gent, Belgium</td>
</tr>
<tr>
<td></td>
<td>Case 15: Ulm, Germany - Tram Development</td>
</tr>
</tbody>
</table>
Resources and Tools 资源和工具

Manual for Good Public Participation
The manual developed by the Germany Ministry for Transport is addressed to all those who have responsibility in the sphere of planning and approval procedures and to the general public. It contains proposals as to how existing formal participation (dark blue) at the various procedural levels can be improved and complemented by informal participatory steps (light blue).


Austrian Society for Environment and Technology
This manual aims to give an overview how to apply public participation and about different application fields. Moreover it stresses out the different stages of participation and success factors for an effective implementation

Guidemaps Project
Consultation and participation of key stakeholders and members of the public when developing sustainable transport measures is a valuable process, helping to drive public acceptance and design more effective schemes. This handbook, produced by the GUIDEMAPS project, provides a great deal of advice on this topic together with practical examples from cities that have used innovative public participation strategies to help them to improve their planning and delivery of sustainable transport policies.


European Urban Knowledge Network
The aim of the Policy Lab in Cyprus is to explore how participatory planning processes can be made more efficient and especially more effective. This factsheet provides a broader overview of the way public participation is organised in different countries. Firstly, it outlines the notion of public participation in general, before going more in-depth into the way participation processes are organised in different EU countries. Different case studies, tools and relevant research studies on public participation in the development process are included

Public Participation in the Development Process
The CIVITAS ELAN project

Citizen Engagement has compiled the experiences of five European cities in one document, covering case studies on participation processes in projects like the development of comprehensive cycling strategies, re-developing a main train station area, designing a congestion charging scheme or an entire Urban Mobility Plan.

CIVITAS ELAN - Work and Lessons Learned Related to Citizen Engagement


Illustrations

Picture: Planning transport not only for but with citizens can increase acceptability of projects and helps gather important information for the planning process.

Source: Kaihsu Tai Licensed under CC BY-SA 4.0 via Wikimedia Commons
4.2.2 Transit Improvement 公共交通提升

**A. Electric, fuel cells and hybrid buses**

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Electric, fuel cells and hybrid buses 电动、燃料电池和混合动力公共车</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响:</td>
<td>Shift, Improve</td>
</tr>
</tbody>
</table>

The comparative environmental benefits of public transport are known: low impact on air pollution, less noise pollution, substantially less land consumption. But also a higher energy efficiency and less greenhouse gas emissions compared to individual transport are substantial benefits of public transport. Efficiency gains in recent years were mainly realised by more efficient ancillary equipment (e.g. heating), operational measures (e.g. driver training) and increasingly fuel efficient and clean vehicles. Beyond the growing application of highly efficient conventional diesel-engine busses, energy efficiency can be increased by means of battery electric and hybrid busses. Busses in urban areas are constantly operating in a stop-and-go mode which increases the effectiveness of recuperation of braking energy. There are several pilot systems currently tested in Europe.

Depending on the technology applied, electric buses cost around twice as much as conventional buses. In addition, developing the charging infrastructure represents an extra expense. At the same time there are considerable benefits during operation: The buses are electric, which results in a large reduction in fuel costs and makes the buses 100% emission free (on location). E-busses further result in reduced noise and improved public health.

Currently running pilots show that hybrid busses can reduce fuel consumption by 20%. However, many pilots also showed that market readiness is a crucial issue as operational downtime increased compared to diesel busses. In the long-term fuel savings of up to 30% are realistic. The highest emission and energy saving potential remains with trolley busses (see trolley bus Position Paper). The European Commission’s hydrogen bus project has demonstrated over three years in nine EU cities that hydrogen is a viable zero-emission alternative to diesel and gasoline – provided that the energy generating the hydrogen comes from non-fossil sources. The buses transported 8.5 million passengers over 2.6 million km, using 555 tonnes of hydrogen instead of 1 million litres of diesel. Of the people surveyed, 68% said they wanted to see more of these buses, and 44% were willing to pay more for them.

**Munich investing massively into e-mobility.** The city of Munich, Germany has the ambition to become the German city with the most extensive network of charging stations in Germany. It wants to be at par with Oslo which holds the European record. The proposed investment of Euros 30.5 million shall finance a network of city-owned loading stations for electric vehicles. Currently, some 11,000 electric cars are circulating in Munich, and it is projected that by 2020 some 17,500 will be on the roads of Munich. The city is of the opinion that the national government’s targets of new energy
cars can only be achieved if the city invests in the required infrastructure.  

**Plans for an electric car charging point in every new home in Europe**

Car manufacturers welcome plans by the EU to boost the convenience of electric cars by increasing recharging facilities

Norway and the Netherlands have both announced plans to completely phase out vehicles with diesel engines by 2025. Photograph: Pawel Libera/LightRocket via Getty Images

Every new or refurbished house in Europe will need to be equipped with an electric vehicle recharging point, under a draft EU directive expected to come into effect by 2019. In a further boost to prospects for the electric car market in Europe, the regulations due to be published before the end of the year state that by 2023, 10% of parking spaces in new buildings in the EU zone will also need recharging facilities. The EU initiative is intended to lay the infrastructure for the sort of electric car boom envisaged by Norway and the Netherlands, which both plan to completely phase out vehicles with diesel engines by 2025. As well as extending the driving range and convenience of electric cars, the mushrooming number of recharge stations would allow vehicles to feed their electricity back into the grid. That in turn would open the door to a futuristic world in which cars supply energy to Europe’s power network at all times of the day and night, balancing shortfalls from intermittent renewable energies when the sun is not shining and the wind not blowing. “This kind of market stimulus is not just positive, it is mandatory if we want to see a massive rollout of electric vehicles in the near future,” said Guillaume Berthier, sales and marketing director for electric vehicles at Renault, which recently unveiled an electric vehicle with a 250-mile range. “The question of how you recharge your car when you live in an apartment within a city is a very important one.”

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5 Muenchen investiert massiv in E-Mobilitaet. Frankfurter Rundschau. 22 April 2015.

6 The emergence of the self-driving car has stimulated a discussion about its possible impact on cities and towns. One hypothesis is that self-driving cars might help to reduce travel. The optimistic consensus is that the autonomous car will likely be shared, smaller, lighter, slower, and less vehicles. Driverless and autonomous vehicles (AVs) will be transformational. With the right planning, they offer the potential for a better quality of life, economic growth, improved health and broader social connections, by offering convenient and affordable mobility to all of us, regardless of where we live, our age or ability to drive. See: Alter, L. 2016. How self-driving cars might improve our cities and towns. 6 May 2016. http://www.treehugger.com/urban-design/how-self-driving-cars-might-improve-our-cities-and-towns.html
**Air pollution and electric cars.** The EU moves are designed to help cut roadside emissions, however, in the short term they may lead to a higher than expected sulphur dioxide (SO2) emissions from road transport by 2050 according to a recent report by the European Environment Agency (EEA). Magda Jozwicka, the project manager of the EEA’s research, said there would be a five-fold increase in SO2 emissions by 2050 from electricity production compared to a situation with no electric vehicles. Although this assumption was based on the current energy mix projected by the European commission, which includes coal-burning power plants. The EEA report, which calls for new sulphur dioxide abatement measures in the EU, also says that the additional power demand from a burgeoning electric vehicle sector, which is predicted to account for 80% of cars by mid-century, will strain supply capacity. This could require the construction of 50 new power stations across Europe by some estimates. Martin Adams, the head of the EEA’s air pollution unit said: “A higher amount of electric vehicles will need additional power to be generated. The source of this extra energy is of prime importance. It is clearly feasible that we use clean renewable sources but when you think of where the different countries are at, I think some fundamental decisions are needed to develop a more sustainable energy system across Europe.”

**Local power storage.** The French carmaker Renault said that it accepts that electricity supply problems could emerge as the vehicles’ market share increases exponentially, although it sees a solution. “We could make a huge investment to green our electricity but I personally think the future will be built around local storage with a second life battery,” Berthier said. Vehicle batteries that have worn down still contain energy which can be topped up with energy from on-site wind and solar power generators and sold back to the grid at peak times. Renault is strategically partnering with companies such as Connected Energy in second-life projects, while last month, BMW opened a similar 2MW power station near Hamburg, using 2,600 used electric vehicle batteries.

This electric car integrates solar panels for self-charging

© Sono Motors

“The Sion has seating for 6, a range of 150+ miles, 7.5 square meters of solar cells, an air filtration system that uses moss, and a price of less than $18,000. A German startup, Sono Motors, has just finished a successful crowdfunding campaign to take its Sion electric car prototype to the next step, and if all goes well over the next year or so, it could go into production as early as 2018. At a time when many auto companies are quickly trying to catch up to the electric car trend with their own electric models (thanks, Tesla), the Sion is one of the only examples of an electric vehicle that includes a self-charging aspect, which could make it the perfect vehicle for enabling free ‘fuel’ for those with short commutes.”


Electric vehicles will transform everything

Electric vehicles won't just change how we get around. They'll transform large swathes of how our economy operates.

Vehicle maintenance and retail: Electric cars require much less maintenance than your average gas guzzler, meaning both neighborhood repair shops and big box dealerships may be in trouble. The authors suggest we’ll see more Tesla-like retail locations in malls and other convenient locations, combined with out-of-town second hand dealerships. And because electrification is likely to go hand-in-hand with increasingly autonomous/semi-autonomous vehicles, demand for auto body repair work is likely to drop too.

Autoparts suppliers: If you make gearboxes you are probably going to need to diversify. If you make batteries, you may be about to get busy. That's an over simplification, but you get the idea.

In fact, one of the biggest areas for potential uncertainty on this whole topic may not be whether people go electric, but how they choose to go electric. We've already seen how e-bikes may broaden the appeal of cycling, for example, and car ownership may become pointless in many cities. The only
thing we can say for certain is that things will change. And electric vehicles of all shapes will be a big driver in making that happen.


**Examples**

**Case 16:** Berlin, Germany – E-Bus Berlin
project duration: 01/2013 - 09/2016
Contact: ruppert.stuewe@bvg.de

**Case 17:** Freiburg, Germany – (Retrofitting buses)
Contact: christine.kury@vagfr.de

**Case 18:** Baia Mare, Romania - Clean Fleets case study (First EEV buses)
Contact: exploatare@urbisbaiamare.ro

**Case 19:** London, United Kingdom - Clean Fleets case study (The New Bus for London-Diesel/electric hybrid)
Contact: andrewrobb@tfl.gov.uk

**Case 20:** Vienna, Austria - Clean Fleets case study (Innovative Electric Buses in Vienna)
Contact: post@wienerlinien.at

**Case 21:** EU – ZeEUS (Zero Emission Urban Bus System) Project
http://zeeus.eu/demonstrations-activities/demonstrations

**Case 22:** EU - Clean Fleets (Purchasing Clean Public Vehicles)
http://www.clean-fleets.eu/training-and-events/workshop-bremen/

**Resources and Tools**

**E-Learning**

**Training Programme:**
As part of the Clean Fleets project a training programme on the EC Clean Vehicles Directive was developed and tailored towards trainers, consultants and experts in public procurement or leasing of vehicles.

Training material
http://www.clean-fleets.eu/training-and-events/train-the-trainer/
Clean Busses Report
This publication draws together information on the environmental performance, cost and practical aspects associated with 17 different fuel and technology types.

Experiences have been taken from over 100 public authorities and transport operators across Europe.


Life Cycle Cost Calculator
Aimed at public authorities and fleet operators, the Clean Fleets project's Life-Cycle Cost Calculator is an easy to use tool to allow a comparison of the life-cycle costs (LCC)/total costs of ownership (TCO) of different vehicles and bids within a procurement process.


Clean Vehicle Legislation
The Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles (2009/33/EC known as the Clean Vehicles Directive) is aimed at a broad market introduction of more efficient, lower emission vehicles. It requires public purchasers and private companies running public transport services to consider energy and environmental impacts when purchasing road vehicles.


London will have Largest Electric Bus Fleet in Europe by End Of 2016

“London is notorious for its smog. That’s why it's really exciting news—as reported by Business Green—that London is set to have the largest all-electric bus fleet in Europe by the end of [2016]. Anyone wanting to check out the new buses will be able to do so on bus routes 507 (from Waterloo station to Victoria) and 521 (from Waterloo station to London Bridge) which will both run using a 51-strong fleet of single-decker exclusively electric vehicles by the end of the year. Of course, two bus routes going electric is not going to solve London's air quality problems. But this is part of a much bigger push that includes converting all 300 single-decker buses in the center to zero emissions by 2020 at the latest, and converting all double decker buses to hybrid by 2019. Add that to other innovations like pedestrianizing Oxford Street, massively upgrading cycling infrastructure, and promoting range extended plug-in electric cabs, and it starts to feel like this great world city is beginning to take its air quality issues seriously.” Prediction is that in 2050 London “won’t need cars at all.”

Einhoven and Helmond, The Netherlands: 2 Dutch cities convert entire bus fleet to electric

“As of December 11th [2016], the Dutch cities of Eindhoven and Helmond will not have a single public bus running on diesel.”


Pilot projects Fuel Cells

The EU-funded Clean Hydrogen in European Cities (CHIC) project is deploying a fleet of fuel cell electric buses and hydrogen refuelling stations across Europe. It aims to further enhance fuel cell urban bus technology and offers a functional solution for European cities to decarbonise their fleets.

Website: http://chic-project.eu

London: All new city center single-decker buses will be zero emission


See also: Mayor unveils first fully electric bus routes for central London. 09 September 2016. https://www.london.gov.uk/press-releases/mayoral/mayor-unveils-first-fully-electric-bus-routes

### Results:


### Case Studies:

- **Bavaria** [http://ieahia.org/pdfs/bavarian_proj.pdf](http://ieahia.org/pdfs/bavarian_proj.pdf)

### Zero Emission Urban Bus System

ZeEUS aims to be the main EU activity to extend the fully-electric solution to the core part of the urban bus network. It fits within the context of the European Commission’s objective to create a competitive and sustainable transport system. To achieve its mission, ZeEUS will test innovative electric bus technologies with different charging infrastructure solutions in eight demonstration sites across 6 European countries to validate their economic, environmental and society viability.

- **Link**: [http://zeeus.eu/](http://zeeus.eu/)

### Environmental performance report

The German Federal Ministry for Transport analysed the effect of an increase in renewable energies on energy efficiency in public transport.

- **Summary (German only)**: [http://www.oeko.de/oekodoc/2162/2014-712-de.pdf](http://www.oeko.de/oekodoc/2162/2014-712-de.pdf)
Illustrations

Picture: Charging station in Geneva
Source: Hoff1980 Licensed under CC BY-SA 3.0 via Wikimedia Commons

Picture: Citaro fuel cell bus in public service on route 25 in London, outside Stratford railway station
Source: Open, Wikicommons
### B. High quality bus systems and Bus Rapid Transit

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>High quality bus systems and Bus Rapid Transit 高质量公交系统和快速公交系统</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td>Shift&lt;br&gt;Improving the urban road network in a sustainable manner by introducing a bus rapid transit system (BRT) will provide high public transport service and increase traffic safety. BRT is best implemented on main roads of cities and</td>
</tr>
</tbody>
</table>
metropolitan areas which need to transport large numbers of passengers. As most BRT systems use modern buses running on dedicated corridors, they are usually accompanied by gains in local air quality and reduced greenhouse gas emissions.

While BRTs are mostly implemented in large metropolitan areas there is a grey area between a regular bus system and BRT or Trams. An evolving concept called: Bus with a high level of service (BHNS). The system is especially suitable for the high density urban environment in Europe. The Bus with a high level of service is a concept coming from road public transport, aiming at ensuring structuring services satisfying a set of criteria linked to efficiency and performance. It draws inspiration from the Bus Rapid Transit system in operation and local specificities.

Examples

Case 23: Lyon, France - BHNS

Case 24: Gothenburg, Sweden - BRT

Case 25: Istanbul, Turkey - BRT

Case 26: Dublin, Ireland – Quality Bus Corridors

Further case studies from Budapest (Hungary), Madrid (Spain), Bremerhaven (Germany)

Resources and Tools

Study materials
Principles of successful high quality public transport operation and development - has helped to plan, develop and implement effective and efficient public (bus) transport systems in small and medium sized European cities. Detailed analysis of data and experiences of 67 small and medium sized European cities in 24 European countries has led to a better understanding of success factors and pitfalls for efficient and effective public bus transport.

Project Website: http://www.proceedproject.eu/

Training material
Presentation
http://www.eltis.org/resources/training/proceed-study-materials
Guidelines
European Bus System of the Future

EBSF aims at developing a new generation of urban bus system adapted to the requirements of European cities. EBSF acts therefore as a driver to increase the attractiveness and raise the image of bus systems in urban and suburban areas, by means of developing new technologies on vehicles and infrastructures in combination with operational best practices.

Project Website: http://www.ebsf.eu/index.php/objectives

BRT Standards

The standard provides an evaluation methodology for BRTs and provides quality standards and minimum requirements.


Guidelines for Innovative Bus Systems

Guidelines NICHES

The guideline describes the required framework conditions, best-practices and the project management cycle for concept to implementation.


Guidelines France

This guideline describes the required service levels, components and benefits of a high-quality bus system in France


Cities for Mobility: http://www.cities-for-mobility.net/documents/wc08/cfm_world_congress_workshop_a_madrid.pdf
**BRT Platforms**

BRT Data provides key information on all BRT systems worldwide  
BRTData [http://brtdata.org/](http://brtdata.org/)

**BRT Policy**

The Konsult-Platform provides a policy background, principles, performance criteria and case studies  
Konsult [http://www.konsult.leeds.ac.uk/pg/11/](http://www.konsult.leeds.ac.uk/pg/11/)

**BRT Planning guide**

The Bus Rapid Transit Planning Guide is the most comprehensive resource for planning a bus rapid transit (BRT) system, beginning with project preparation all the way through to implementation.  
Available in English and Chinese


**Illustrations 图片**

*Picture: METTIS BHLS in Metz (France). Pictures show hybrid bi-articulated bus.  
Source: Photo by BavaAlcide/ CC BY-SA 3.0*
A BHLS has some of the features (e.g., Right of way) of a BRT but is more flexible and appropriate to the EU urban environment.

Source: Flickr - by IngolfBLN - Nantes - Busway - Ligne 4 Licensed under CC BY-SA 2.0 via Wikimedia

Source: Daniel Bongardt
### C. Integrated ticket and fare system

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Integrated ticket and fare system</th>
</tr>
</thead>
</table>
| Shift           | Integrated fare systems for public transport should provide a comfortable access to a public transport system. They allow passengers to make journeys involving transfers within or between different transport modes (buses, trains, carsharing etc.) with a single ticket or smart card. One payment method should be valid for the complete journey. In addition, public bicycles or car sharing can be included. Integrated ticketing encourages passengers to use public transport by simplifying the fare structures and making switches between transport modes easier, increasing the efficiency and attractiveness of the services. Many of the large cities in Europe have moved beyond this to contactless Smartcards (e.g. Oyster in London, Navigo in Paris, Pastel in Toulouse) which removes the need to queue up to purchase a ticket and speeds up the passage through the ticket gate. A new generation of transport payment systems are also starting to be developed based on contactless credit card and mobile phone (e.g. London, German Railway).

The high usage, network coverage and customer satisfaction of the Oyster card in London serves as a role model for other big cities. Since its launch on 30 June 2003, around 60 million Oyster cards have been issued and over 85 percent of all rail and bus travel in London is paid for using Oyster. The number of people paying cash has dropped to less than one percent. This high level of usage generates a wealth of data, which is essential for transport planning. |

**Examples**

<table>
<thead>
<tr>
<th>Case 27: London, United Kingdom: TfL’s Contactless Ticketing-Oyster and Beyond</th>
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<th>Case 28: Bremen, Germany: Integrated Transport Pricing System</th>
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<tr>
<th>Case 29: EU: POLITE (Policy Learning in Information Technologies for Public Transport Enhancement) Project</th>
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<tr>
<th>Case 30: CIVITAS Highlights on Ticketing and Tariffs</th>
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</table>
### Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th>Guidelines on Smart Ticketing</th>
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<tbody>
<tr>
<td>The Guidelines target the organisations in charge of decision making and technical deployment of ITS on local level. For each key application of urban ITS a separate document has been issued:</td>
</tr>
<tr>
<td>- Traffic and Travel Information</td>
</tr>
<tr>
<td>- Smart Ticketing</td>
</tr>
<tr>
<td>- Traffic Management and Urban Logistics</td>
</tr>
<tr>
<td>The report covers the following topics: Data privacy, smart ticket standards, integration with travel managements, smart wallets, marketing, legal and organisational issues, business models.</td>
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<table>
<thead>
<tr>
<th>UK DOT Strategy Door-to-Door Public Transport</th>
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<tbody>
<tr>
<td>To make public transport more convenient it must be as convenient and straightforward to make a door-to-door journey by public transport, by bike or on foot, or by combining these different means, as by private transport. Integrated ticketing is a core aspect of the strategy developed by the UK Department of Transport.</td>
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<table>
<thead>
<tr>
<th>Training material</th>
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<tbody>
<tr>
<td>The toolkit describes 94 different solutions across a variety of different scenarios, to help policy-makers decide which is most appropriate. These are accompanied by tools to assess and evaluate the effectiveness of different measures. It can be used to find inspiration for solutions to problems, or to compare potential solutions which a user already has in mind.</td>
</tr>
<tr>
<td>Project website: <a href="http://www.interconnect-project.eu/">http://www.interconnect-project.eu/</a></td>
</tr>
</tbody>
</table>
## Reading List

The GIZ sustainable urban transport project developed a comprehensive reading list covering various aspects of integrated public transport including smart ticketing.

Download [here](http://www.sutp.org/component/phocadownload/category/87-rl-pti?download=146:rl-pti-en)

## Integrated Smartcard payment

**London:**  
Oyster is a smartcard which can hold pay as you go credit, Travelcard and Bus & Tram Pass season tickets. It can be used to travel on bus, Tube, tram, DLR, London Overground and most National Rail services in London.

Results, Challenges [here](http://www.eltis.org/discover/case-studies/examining-10-years-londons-oyster-travel-smartcard-uk)

Picture: Transport for London (flickr)

## Policy Recommendations

This study deals with the issue of integrated ticketing on long-distance passenger transport services and the integration in urban transport. By presenting and assessing selected practices in this domain, it highlights the major policy and technical challenges and formulates recommendations for further EU action on this issue.

Download [here](http://www.smart-ticketing.org/downloads/reports/EU_Parliament_study_integrated_ticketing.pdf)
Technical Solutions and Case Studies

The report on integrated e-ticketing presents a range of technical solutions and discusses their feasibility. Further case studies from UK, Italy, Germany are presented.

Download

Case Study: Touch and Travel Germany

Touch and travel is a new way of mobile ticketing. Either by using GPS positioning, barcode scanning at the station or NFC the app starts wherever the passenger is getting into the train or bus. Payment is done automatically once the passenger logs off at the final destination. The mobile ticket is valid for regional trains, high-speed trains, busses, trams, subways within Germany and to some destinations in Europe.

Touch and Travel on the Bahn website

Illustrations 图片

Picture: An Oyster validator at a tram stop in London
Source: Licensed under CC BY-SA 3.0 via Wikimedia Commons
D. Public Transport Financing

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Public Transport Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Shift</td>
</tr>
<tr>
<td>内容和影响</td>
<td>Farebox revenue commonly does not cover the cost of providing high quality public transport services in cities. Funding sources for capital and operational costs are diverse and many different funding streams are in practice. In some cases, fares are regulated in order to allow lower income households to benefit from access to public transport and are not set at cost-recovering levels. What is clear is that no single financing model emerges, reflecting the great diversity of local situations and needs. While some transport infrastructure internalise the positive external effects (land value capture), some sell naming rights or implement other merchandising measures. This chapter presents tools and case studies for a sustainable urban transport financing.</td>
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</table>

Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th>UITP Financing Position Paper</th>
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<tbody>
<tr>
<td>The purpose of the public transport Financing Position Paper is to provide inspiration on innovative revenue sources, critical analysis of existing and emerging practices, best practice case studies, and further references (only for UITP members)</td>
</tr>
</tbody>
</table>
Training Material

Financing public transport in Germany:

**Module 1**: History and current regulations
**Module 2**: Case Study Berlin
**Module 3**: Case Study Frankfurt
**Module 4**: Turning the trend

Download link to all modules

Alternative financing in Germany

Case Studies

The report presents a range of municipal financing models. Case Studies include Madrid, Paris, London

Further case studies:

- Public Transport Financing in Sweden
  [http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/stenerikringqvist.pdf](http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/stenerikringqvist.pdf)
- Overview of fiscal regimes for commuting in Europe:

Land value capture

- **Sweden**: Land value as the basis for cost sharing in financing infrastructure in Sweden
  [http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/hgwessberg.pdf](http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/hgwessberg.pdf)
- **London**: Joint development
  [http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/stephendadswell_land_value_capture_and_the_brs_4_march_201.pdf](http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/stephendadswell_land_value_capture_and_the_brs_4_march_201.pdf)
- **Copenhagen**: Transit Oriented Development and financing of Copenhagen Metro
  [http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/henrikplougmannolsen.pdf](http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/henrikplougmannolsen.pdf)
<table>
<thead>
<tr>
<th>Reading List</th>
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<tbody>
<tr>
<td>The Sustainable Urban Transport Project (GIZ SUTP) has produced a reading list for policymakers detailing available material on financing urban transport projects. Instruments are listed for the national, local and even international (climate finance) level.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Technical Paper</th>
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<tbody>
<tr>
<td>The study presents an analysis of a variety of financing and planning practices world-wide in order to help decision-makers identify suitable elements for their local context.</td>
</tr>
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<table>
<thead>
<tr>
<th>Who pays what for urban Transport?</th>
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<tbody>
<tr>
<td>This Handbook draws from subject-based analyses and case studies and highlights key examples of funding solutions which can be mobilised in the public transport sector. The idea is to present a frame of reference for decision-makers.</td>
</tr>
</tbody>
</table>
Technical Document – Financing SUT

This Sourcebook module provides detailed information on available options for financing urban transport. It presents different financing instruments and ways in which they can be best used, and how to optimally combine them.

Download (English)

Download (Chinese)
http://www.sutp.org/component/phocadownload/categor y/23-1f?download=24:1f-fsut-cn

Towards better fare regulation and adjustment

This Focus Paper aims to support the development of more regular, systematic and sophisticated fare review mechanisms that will make it possible to sustain the provision of public transport services and enhance quality, while keeping services affordable.

Download

Funding needs assessment

The report on behalf of the European Director General for Mobility and Transport assesses the financing needs for several types of sustainable transport systems in the European Union.

Download

Funding Models

Overview of alternative models for financing (PDF)
http://www.k2centrum.se/sites/default/files/fields/field_up pladdad_rapport/francescamedda_0.pdf

Practical Experiences. Secondary Revenues. Retail and advertisement (PDF)
http://www.k2centrum.se/sites/default/files/fields/field_up pladdad_rapport/atsushisakai.pdf
Illustrations 图片

Picture: Transport systems create increase the value of adjacent property. Land value capture is a way of internalising these effects.  
Source: Daniel Bongardt

Picture: Advertisements on vehicles increase the revenue for operators  
Source: Daniel Bongardt
E. Trolley Bus Systems and In-Motion Charging

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Trolley Bus Systems and In-Motion Charging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Shift/improve</td>
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</tbody>
</table>

A trolley bus system is a public transport mode using electric propulsion provided by overhead wires. It offers the opportunity to use renewable energy and is therefore able to encourage a shift to mass transit and to higher energy efficiency at the same time. High infrastructure costs and the little appealing impact on city design are main arguments against trolley bus systems.

Meanwhile, in-motion charging systems are about to cause a revival of trolley systems. Current pilots combine purely Li-ion-battery propulsion with overhead conductive charging. The batteries are charged while the vehicles are in operation using the overhead lines. The bus can receive power either via the catenary or the lithium-ion battery. On short distances, for example in the depot, the bus can additionally run on super-capacitors. This system reduces infrastructure demands in terms of overhead wires and provides greater operational flexibility.

The special feature of these buses lies not only in their unusually large passenger capacity but also in their completely GHG emission and air pollutant-free operation. Trolley bus systems are therefore especially suitable for highly populated areas. Compared to tram systems they are operationally more flexible, have lower infrastructure demands and produce less noise. The life cycle emissions of trolley bus systems depend on the upstream emissions of the energy production. Current pilots systems are operated in Zürich and Geneva (Switzerland), Gdynia (Poland).
Examples

Case 31: Eberswalde, Germany: Europe’s first Trolley-Battery-Hybrid-Bus operating in Eberswalde
http://www.trolley-project.eu/index.php?id=98&tx_ttnews%5btt_news%5d=56&cHash=4ce526b3dbf5c443f5f836af36db6c0

Case 32: Leipzig, Germany: Take-up guide for the Replacement of urban Diesel buses by Trolleybuses
http://www.trolley-project.eu/fileadmin/user_upload/Outputs/TROLLEY_PR6_Take_up_Guide_Core_Output_4.3.8_Annex_146_PP05_LVB.pdf

Resources and Tools

E-Learning course:
1. Trolleybus Basics
2. Selling an Idea: (Re)introducing a Trolleybus System
3. Optimising the Use of Energy I +II
4. How to Convert a Diesel Bus into a Trolleybus
E-Learning Trolley
http://www.trolley-project.eu/index.php?id=96

Reference Guide On Trolleybus Tram Network Use

Guidelines:
It is the objective of the EU Trolley project to compile a compendium in which all possible synergies between an electric bus system and a tram system are examined, assessed and documented. The reference guide and several pilot evaluations can be downloaded on the project’s website.

Downloads: http://www.trolley-project.eu/index.php?id=44

European Trolleybus Knowledge Center

The European Trolleybus Knowledge Center serves as main European information hub on trolleybuses providing contacts to European trolleybus experts and most relevant links and documents (library) to all those, who wish to learn more about trolleybus systems. Provides an overview of all 307 cities operating trolley bus systems.

Link: http://www.trolleymotion.eu/
Illustrations 图片

Picture: Combined battery electric and trolleybus in Zurich
Type: Hess lighTram 4
Source: Tim Adams (creative-commons)

Picture: Modern trolley bus in city centre of Lyon.
Type: Irisbus Cristalis
Source: ibou69100 - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons.
## F. Metro systems

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Metro systems</th>
<th>Description and impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>地铁系统</td>
<td>Shift</td>
<td>Metro is the most common term for subways, heavy rail transit and also sometimes refers to elevated heavy rail systems. Metros are normally fully grade separated and therefore have no impact on road capacity. Metros are the most expensive form of mass rapid transit (other MRT systems include light-rail, commuter rail and bus rapid transit) but also theoretically have the highest capacity and operate at the highest speed of all MRT systems (40-50 km/h). The systems, if operated underground are almost independent from the topography of cities but best implemented in areas with the need of mass capacity in public transport. Internationally metro systems have attracted passengers from other transport modes (private cars) but if stops are too frequent also from non-motorised transport.</td>
</tr>
</tbody>
</table>

### Examples

**Case 33:** London, United Kingdom: Metro System in London  
- Key facts  
- Network  
- Contact: Transport for London

**Case 34:** Paris, France: Metro System in Paris  
- Key facts  
- Network  
- Contact: RATP Group [http://www.ratp.fr/contact/client](http://www.ratp.fr/contact/client)

**Case 35:** Berlin, Germany: Metro System in Berlin  
- Key facts  
- Network  
  [http://fahrinfo.bvg.de/Fahrinfo/bin/query.bin/dn?ujm=1&MapLayer=NETWORK](http://fahrinfo.bvg.de/Fahrinfo/bin/query.bin/dn?ujm=1&MapLayer=NETWORK)  
- Contact: Berliner Verkehrsgesellschaft [info@bvg.de](mailto:info@bvg.de)

**Case 36:** Nurenberg, Germany: Metro System in Nurenberg  
- automatisation of Metro  

**Case 37:** Vienna, Austria: Metro System in Vienna  
- Reduction of use of individual cars, and simultaneous increase of bicycling and trips taken by public transportation (metro) over 25 years.  
Resources and Tools 资源和工具

Guidelines on railway station design
The resource pack for improved railway station design has been compiled from the experiences of the Dutch National Railways (NS)

Download: www.trendy-travel.eu

Metro modernisation projects

New Tube for London

Paris Metro2030

Tyne and Wear 2030 (UK)
Metro Strategy 2030

Bilbao: Regenerative Braking Energy

More information: climatetechwiki
http://www.climatetechwiki.org/technology/regenerative_braking_in_trains
Overview:
All Metro systems in Europe
http://www.urbanrail.net/eu/euromet.htm

Illustrations 图片

Picture: Metro station Château de Vincennes in Paris
Source: Daniel Bongardt

Picture: A new London Underground S Stock train departs Farringdon with a Metropolitan Line service to Aldgate.
Source: mattbuck. - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons
Picture: Berlin U-Bahn passing the Oberbaumbrücke in Berlin
Source: Sarah Jane at Flickr - Flickr. Licensed under CC BY 2.0 via Wikimedia Commons
## G. Intermodal interchanges

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Intermodal interchanges 联运换乘</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td>Improve/shift</td>
</tr>
</tbody>
</table>

The attractiveness of public transport supply highly depends on its convenience regarding changing from one mode to another to come as close to a door-to-door coverage as possible. Intermodal interchanges that minimise overcrowding, provide short routes, easy access, intelligent information systems and integrate a range of modes (e.g. rail, bus, taxi, carsharing, bike sharing) contribute to the overall systems efficacy. A number of traffic flows of a different nature meet and cross each other at an intermodal interchange. Enhanced transport functions are focused on providing solutions for smart and efficient interaction of these flows in interchanges.

### Examples 案例

- **Case 38**: Birkenhead, UK: Intermodal Interchange in Birkenhead  

- **Case 39**: Gent, Belgium: Intermodal Interchange in Gent  


- **Case 40**: Berlin, Germany: Intermodal Interchange in Berlin  
  [http://kite-project.eu/kite/wiki/index.php/Berlin_Central_Station](http://kite-project.eu/kite/wiki/index.php/Berlin_Central_Station)

- **Case 41**: Bremen, Germany: Intermodal Interchange in Bremen  

- **Case 42**: City-HUB Project’s case studies of Madrid (Spain), London (UK), Thessaloniki (Greece), Helsinki (Finland), Köbánya-Kispest (Hungary)  

### Resources and Tools 资源和工具

**Kite-Wiki**

KiteWiki is a web-based informational source on intermodal transport. The platform provides a wide range of information on intermodal travel including definitions, publications, research projects, white papers, user manuals, guidelines, standards, best practice examples, demand figures and other issues in this field.

Wiki Link  
Guidelines
The guidelines are a key outcome of the EU funded NICHES+ project. They describe several best practices and case studies. The project cycle from concept to reality (preparation, implementation and operation) is described in detail.


Interchange planning Position Paper

A catalogue of integrated planning, design and management tools based on the most advances practices in urban and other related transport sectors.

Project link: [www.nodes-interchanges.eu](http://www.nodes-interchanges.eu)

Position Papers for key areas:
Interchange Technical Tools

Performance Criteria:
The report provides an overview of criteria and indicators that shed light on the performance of public transport interchange facilities.


Future design needs:
The report presents survey results on future user needs and system requirements.


Benchmark tool for usage of ICT:
The tool enables local interchange stakeholders to assess the current level of performance of an interchange in terms of intermodality management through different criteria and indicators.


Knowledge base for intermodal passenger travel in Europe

Best Practice Report: The report is divided into two sections. First it describes services, facilities and characteristics at interchanges that support seamless intermodal travel. The second section provides a catalogue of examples of best-practice including a description of interchanges (railway stations, airports and ports).

Project link: [http://www.kite-project.eu/](http://www.kite-project.eu/)


Cost Benefit Analysis Tool:
Tool: [http://www.kite-project.eu/](http://www.kite-project.eu/)


**LINK the European forum on intermodal passenger travel**

The brochure describes the key concepts of intermodal passenger transport planning and provides a very comprehensive introduction to the topic of intermodality. Challenges and barriers as well as costs and benefits are described in detail. Current EU policies and regulations are outlined.


**Transport for London Interchange planning**

Transport for London (TfL) has launched best practice guidelines which aim to improve the quality of multi-modal transport interchange in London.


**www.tfl.gov.uk/interchange**

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**Illustrations**

The provision of adequate information, seating and service delivery are considered as important factors of an interchange facility based on a survey in the UK.
Figure 6: Important factors of an interchange facility based on a survey in the UK.

Source: Haymarket Station Facility Survey (2006)

Picture: The Berlin Central Station combines long-distance trains, regional trains, tram subway, carsharing and bus services. The station is considered a best case in Europe (see case study)
Source: Open.
At the hub there are several mobility options, such as: metro (2 lines), local buses (20 lines), regional buses (74 lines), long-distance buses (1 line) and taxis. The hub is furthermore easily accessed on foot and by bicycle.

Source: [http://www.cityhub-project.eu](http://www.cityhub-project.eu)

Interchange occurs between London Underground, main line and international rail, and bus services.

Source: Colin / Wikimedia Commons. Licensed under CC BY-SA 3.0 via Wikimedia Commons
H. Intelligent Transport Systems in Public Transport

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Intelligent Transport Systems in Public Transport 智能交通系统应用于公共交通</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td>Shift  The application of innovative Intelligent Transport Systems (ITS) in public transportation has led to a considerable improvement in operational management and service delivery. ITS systems are applied on the driver-vehicle and passenger-service interfaces. The most recognised innovation has been the provision of real-time arrival and departure time information to passengers. The provision of open data has helped to develop multimodal travel planners for seamless door-to-door travel planning. Moreover, it also plays a key role in vehicle monitoring (position, service quality and maintenance diagnostics), through on-board GPS, which is also used to respond to disruptive traffic situations, for bus-traffic light communication and to provide evidence about accidents.</td>
</tr>
</tbody>
</table>

| Examples 案例 | Case 43: San Sebastian, Spain: Fleet Management and ITS - Case study and evaluation report  
http://www.civitas.eu/content/new-fleet-management-system |
|--------------|--------------------------------------------------------------------------------------------------|
|              | Case 44: Monza, Italy: Bus priority systems - Case study and evaluation report  
http://www.civitas.eu/content/public-transport-priority-system |
|              | Case 45: Ljubljana, Slovenia: Real time passenger information  
|              | Case 46: Belgium: Belgian Railway Information System  
http://www.eltis.org/discover/case-studies/railtime-belgian-railway-information-system-belgium |
|              | Case 47: Netherlands: Dutch Trains Are World’s First to Run on 100% Wind Power  
The Netherlands, aka Windmill Country, is now operating 100 percent of its electric trains with wind energy. As of 1 January 2017, 600,000 daily train passengers have been traveling completely carbon neutral, according to an announcement from the Netherlands’ principal passenger railway operator, NS. Dutch electric trains are running on 1.2 billion kilowatt-hours of wind energy supplied by sustainable energy supplier, Eneco. A “decreasing and relatively small number” of Dutch trains are still running on diesel.

Resources and Tools 资源和工具

Guideline

The guideline focuses on provision of travel information en-route for public transport users. Besides guiding the reader from preparation to operation phase it gives best practice examples from Europe.


Fact Sheet: [http://www.niches-transport.org/fileadmin/NICHESplus/ConceptSheets/NICHES __ConceptSheet_3.2.pdf](http://www.niches-transport.org/fileadmin/NICHESplus/ConceptSheets/NICHES __ConceptSheet_3.2.pdf)
### ITS Training Material

The CIVITAS initiative organised a training workshop on advanced telematics for urban transport improvement. The training material for the following topics can be downloaded:
- Case studies
- Evaluation and Monitoring
- ITS in urban transport

Training material:
- [http://www.civitas.eu/content/its-training-workshop](http://www.civitas.eu/content/its-training-workshop)

In the field of transport telematics CIVITAS cities have worked on ITS for traffic monitoring, management and enforcement; real-time road-user information; and ITS-based enhancement of public transport. This highlight focuses on the last of these.


### EU Policy

General ITS strategy of the European Union. Not limited to public transport. Action plan and legal framework for the deployment of intelligent transport systems (ITS) in Europe:

### Selective vehicle detection

The factsheet briefly explains the reasoning behind bus priority and technological solutions applied in London:

Factsheet:
- [http://www.polisnetwork.eu/uploads/Modules/PublicDocuments/london_s_bus_priority_at_traffic_signals_in_a_worldwide_context.pdf](http://www.polisnetwork.eu/uploads/Modules/PublicDocuments/london_s_bus_priority_at_traffic_signals_in_a_worldwide_context.pdf)
## I. Public Transport Organisation

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Public Transport Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Public transport requires a policy making level, a management and an operational level. Usually the policy level defines the broader goals in terms of market share, profitability, financing mechanisms, area, accessibility and target groups. On a policy level intermodality and modal integration is a key consideration. On the management level fares, timetable, routing, vehicle standards, contracting and other service level considerations have to be made to achieve the goals set on a policy level. On an operational level the actual service is produced. This includes infrastructure and rolling stock management (often procurement), vehicle rostering, staff management, cost controlling etc. The three levels do not necessarily translate into separate institutions. The actual institutional set-up differs vastly in Europe but some legal guidelines for the procurement is provided (see legislation below) to make sure that competition is guaranteed. The organization of public transport includes the programming of its operation and development in a given geographical area. For an efficient operation, it is necessary to determine the form of market relations, the market structure and the scope of its regulation as well as the financing system. On a more detailed level, public transport organization includes timetabling, contracting, financing, marketing and pricing policy.</td>
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</table>
### Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th>Training Courses</th>
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<tbody>
<tr>
<td><strong>Elitis Training on Competition and Contracting</strong></td>
<td></td>
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<tr>
<td>This training material covers the rationale for introducing competition, the various approaches taken, using case studies, and the issues of trying to achieve efficiencies in the cost of operating services whilst trying to improve the quality of public transport services through appropriate organisational measures.</td>
<td></td>
</tr>
<tr>
<td><strong>GIZ Training on Bus Regulation and Planning – Bus Sector Reform</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Module 1: A coherent policy and realistic objectives and strategies to achieve them  
Module 2: An industry structure that is amenable to regulation and capable of providing a demand-responsive service  
Module 3: A planning and regulatory framework capable of achieving the policy objectives  
Module 4: A planning and regulatory institution that is capable of administering the regulatory framework  |
| **EU Training on Regulatory Framework**  |
| Module 1: National differences/local adaption  
Module 2: Approaches to Public Transport provision  
Module 3: Planning and control in Public Transport  
Module 4: Contractual Relationships  
Module 5: Quality assurance  
Module 6: Financing  |
| The course material includes extensive case studies, presentations and comprehensive guidelines.  |
Public transport organization

The Transport Innovation Deployment for Europe (TIDE) Project focuses in one of its thematic clusters on the organisation of public transport.

The project differentiates the topic in three themes:

1) Transport management bodies
2) Contracting of services
3) Marketing research


Legislation

In the European Union, route public service obligations are governed by Regulation (EC) No 1008/2008. They must be offered for tender in the Official Journal of the European Union and be open to any transport operator registered in an EU member state. There are limitations in the number of passengers which can be carried where the route can remain eligible for PSO.


Overview on EU transport regulations: UITP: [http://www.uitp.org/policy-issues](http://www.uitp.org/policy-issues)

Case Study Germany

Germany institutionally separates the function of policy making management and operations. The slides include case studies from Frankfurt and Berlin and shows how financing and organisation is correlated. The training material was developed by KCW on behalf of GIZ.
### 4.2.3 Walking and Cycling

#### A. Cycling

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Cycling 自行车出行</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description and impact</strong></td>
<td>The increase in motorisation and decline in cycling in Europe has been a concurrent trend especially in the 1960ies. While cycling has been perceived as transport for poor people it is more and more gaining popularity in Europe. Today people consider cycling as a healthy and often faster mode of transport. Nevertheless, around 50% of all car trips in Europe cover a distance less than 5km. A distance perfectly suitable for cycling. Providing innovative and safe cycling and pedestrian infrastructure can contribute immensely to the share of non-motorised transport. Adequate route planning of an integrated network, development and implementation of safety standards and complementary measures such as parking, corporate cycling strategy and awareness raising are key to increasing the share of cyclist. Safe and convenient pedestrian infrastructure (such as central protective islands on roads, extended pavements, narrowing of the roadway, elevated surface of roadway, improved placement of information signs and lighting) has the potential to not increase the liveability of a city and shifting a considerable amount of traffic to public transport as well. A new emerging trend are cycling highways that allow fast speeds and connect different places of interest of further distance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
<th>Case 48: Germany: Cycling strategy <a href="http://sustainabletransport.org/cycling-expertise-german-experiences-chinese-opportunities">http://sustainabletransport.org/cycling-expertise-german-experiences-chinese-opportunities</a></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Case 50: London, United Kingdom: Cycling Design Standards <a href="https://consultations.tfl.gov.uk/cycling/draft-london-cycling-design-standards/user_uploads/draft-lcds---all-chapters.pdf">https://consultations.tfl.gov.uk/cycling/draft-london-cycling-design-standards/user_uploads/draft-lcds---all-chapters.pdf</a></td>
</tr>
</tbody>
</table>
Case 51: Muenster, Germany: An Example of Promoting Cycling in Cities – Components of a High Quality Bicycle Infrastructure

Case 52: Piraeus, Cyprus: CycleCities Project – Cycling to the Future

Case 53: Leipzig, Germany: CycleCities Project – Cycling Development Plan 2010-2020

Case 54: Copenhagen, Denmark: Developing cycling highways in Greater Copenhagen
http://www.eltis.org/discover/case-studies/developing-cycling-highways-greater-copenhagen-denmark

Concept Note http://supercykelstier.dk/concept

Resources and Tools 资源和工具

Tools
The CHAMP performance analysis tool allows cities to reflect on their current cycling policy and helps identify their strengths and weaknesses. Starting from this baseline, a city can define new objectives to improve its cycling policy and choose which actions to focus on.

Link to self-assessment of European cities:
http://www.champ-cycling.eu/en/About-Champ/The-partners/
Tool: http://www.champ-cycling.eu/en/Stay-a-Champ/Performance-analysis/
### Cycling Visions and Strategies

#### London
One of the most forward-thinking cycling plans is the Vision for Cycling in London.  
London’s vision:  

Cycling Superhighways:  

#### Berlin
Berlin has successfully reversed the trend and sees a steady increase in the modal share of cycling:  
Berlin’s strategy:  

#### Amsterdam
Also called the capital of cycling. The cycling plan focusses on parking as one of the major issues in Amsterdam.  
Amsterdam’s strategy:  

#### Copenhagen
One of the most innovative cities when promoting cycling for its citizens is Copenhagen. Their ambition from getting to good to best is captured in their ambitious strategy:  
Copenhagen strategy:  
[http://kk.sites.itera.dk/apps/kk_pub2/pdf/823_Bg65v7UH2t.pdf](http://kk.sites.itera.dk/apps/kk_pub2/pdf/823_Bg65v7UH2t.pdf)

Factsheet:  

### Best practices

#### Transport for London
The Transport for London team compiled a list of international cycling infrastructure best practice study. The analysed cities include Berlin, Munich, Nantes.

Best practice study:  

European examples on cycling highways:  
Factsheet  

#### Bicycle policies in cycling capitals
The report takes the example of the ten most successful cities in terms of cycling promotion in Europe and presents the underlying policies.

**Champ project:**
The focus of CHAMP is the exchange of good practice and lessons learned in leading cycling cities in Europe. The website provides resources such as evaluation tools, performance indicators and best practice examples.

Project website: [http://www.champ-cycling.eu/](http://www.champ-cycling.eu/)

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**Cycling Plans, Strategies and Design Guidelines**

This document is a collection of cycling-related strategies, policy plans and guidelines worldwide. It gathers both, national and local policies and approaches and presents outline strategies to increase the cycling modal share by considering various factors.


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**Guidelines and Standards**


Cycling inclusive policy development:
- Handbook (GIZ) [http://www.sutp.org/further-downloads/category/100-cycling-handbook](http://www.sutp.org/further-downloads/category/100-cycling-handbook)

Infrastructure design:
### Cycling-Inclusive Policy Development

This handbook provides detailed information on how to develop cycling-friendly policies and facilities. The key ideas behind this document are based on the creation of an integral plan, by offering a revealing look at the crucial relationship between town planning and traffic and transport policy.

Download
http://www.sutp.org/component/phocadownload/category/61-tc-cycling?download=126:tc-cyc-en

### German Cycling Expertise

There is a broad demand for Germany’s know-how in bicycle policy and infrastructural planning. The German bicycle portal contains a lot of resources: more than 4000 news, publications, research results and good practice examples.

Analyses: [http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#analyses](http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#analyses)
Infrastructure: [http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#infrastruct ure](http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#infrastruct ure)
Organisation: [http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#organisation](http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#organisation)
Service: [http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#services](http://www.nationaler-radverkehrsplan.de/transferstelle/?LANG_ID=en#services)

### German Cycling Strategy

In many places, the enhanced importance of cycling is manifested in growing modal shares of cycling and greater public attention. Germany is already in the top third of European countries in terms of cycle use. The NCP 2020 is designed to unlock the further potential inherent in cycling. The NCP 2020 describes the strategy to be used to evolve the promotion of cycling in Germany.

Website: [http://www.nationaler-radverkehrsplan.de/](http://www.nationaler-radverkehrsplan.de/) (GER)

### Cycling Academy

The Cycling Academy provides training to municipal administrations and planners. The Academy informs participants on latest technical developments and changes to the legal framework.

[http://www.fahrradakademie.de/](http://www.fahrradakademie.de/)
### Cycling Promotion

The EU funded PRESTO project has developed a series of factsheets on raising the profile of cycling locally, such as designing communications campaigns, training on bicycle use and safety, and other measures such as cycling maps and cycling counters.

**Factsheets:** [http://www.eltis.org/resources/tools/promoting-cycling-effectively](http://www.eltis.org/resources/tools/promoting-cycling-effectively)

### Position Paper

The GIZ Publication gives a comprehensive overview on relevant publications regarding non-motorised transport policies.

**Reading list technical policies:**

**Reading list urban cycling strategies:**
The list was compiled by GIZ and provides an overview of the most important cycling strategies worldwide.

### Knowledge platform

The cycle cities knowledge platform provides information and best practices regarding the following cycling related topics:
- Infrastructure
- Mobility management
- Cycling and Intermodality
- Bike Sharing Systems
- Bicycle economics
- Cycling tourism
- Health & Environment
- Cycling and Sustainability

**Project website** [www.cyclecities.eu](http://www.cyclecities.eu)
**EuroVelo**

The EU-funded project's main goal is to develop a comprehensive interconnected cycling network covering all of Europe. The project compiled a list of best practices and academic studies.

Project website: [http://www.eurovelo.org](http://www.eurovelo.org)

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**Illustrations** 图片

Picture: Bicycle Expressway in the Netherlands
Source: „Fietssnelweg F35 at Go Planet“- Wikimedia Commons. Licensed under CC BY-SA 3.0 via Wikimedia Commons

Picture: Cycle route information in Germany.
Source: Daniel Bongardt
### B. Bike Sharing

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Bike Sharing 自行車共享</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and Impact 内容和影响</td>
<td>Bike sharing schemes involve short-term urban bicycle rental schemes that enable bicycles to be picked up at any self-serve bicycle station and returned to any other bicycle station, which makes bicycle sharing ideal for point-to-point trips. Bike sharing is a valuable instrument to foster clean and energy efficient sustainable modes of mobility in urban areas. As of September 2014, more than 700 cities in 57 countries host advanced bike-sharing programs, with a combined fleet of close to 800,000 bicycles (see Factsheet <a href="http://www.earth-policy.org/images/uploads/press_room/1409_Bicycle_Share_Updated.pdf">http://www.earth-policy.org/images/uploads/press_room/1409_Bicycle_Share_Updated.pdf</a>)</td>
</tr>
</tbody>
</table>
Website Bike Sharing nationwide [http://www.blue-bike.be/](http://www.blue-bike.be/) |
### Case 56: London, United Kingdom: Customer Satisfaction Report


Website Bike Sharing London
http://www.tfl.gov.uk/modes/cycling/santander-cycles/how-it-works

### Case 57: Paris, France and Barcelona, Spain


### Case 58: Malaga, Spain: Implementing Sustainable Mobility

http://www.civitas.eu/content/promotion-cycling-public-bicycle-scheme-malaga

The Cycle-Cities project provides a comprehensive list of bike sharing systems worldwide: http://www.cyclecities.eu/bike-sharing-systems

### Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th><strong>Handbook: Optimising Bike Sharing in European Cities (OBIS)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>OBIS identified good practices, success factors, limits and market potentials by analyses, demonstrations and optimised strategies. Key findings and recommendations were published in a comprehensive handbook.</td>
</tr>
<tr>
<td><strong>Reading list:</strong></td>
</tr>
<tr>
<td>Reading list:</td>
</tr>
<tr>
<td>World map of bike sharing systems:</td>
</tr>
</tbody>
</table>
Illustrations 图片

Picture: Bike sharing in Warsaw in Poland
Source: Daniel Bongardt

Picture: Velib is the largest bike sharing system outside China
Source: "Place de la République (Paris), réaménagement, 2012-04-05 39" by Coyau / Wikimedia Commons.
Licensed under CC BY-SA 3.0 via Wikimedia Commons
Picture: Call a bike is owned by the German Railway operator Deutsche Bahn. The bikes are mainly parked at train stations.
Source: Daniel Bongardt

London´s grand vision of the SkyCycle

Source: Foster + Partners
Innovative Circular Cycle Bridge, Hovenring, The Netherlands


Amsterdam: Melkweg’s Cycle Bridge

Source: http://www.contemporist.com/melkwegbridge-by-next-architects/

Copenhagen's Cycle Snake

### 4.2.4 Green City Logistics 绿色城市物流

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Green City Logistics 绿色城市物流</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>The main topic to address in ‘city logistics’ is how to respond to increasing demand for urban freight (in the end it is a result of desired mixed land use) while at the same time decreasing the associated environmental and social impacts. Several policy options are available for public authorities to achieve these goals, including regulations (traffic restriction, low emissions zones), transport pricing and taxes, transport planning and the development of infrastructure dedicated to urban freight (lorry lanes, delivery and loading spaces, urban consolidation centres). Public authorities and private operators, both of whom have an interest in improving their vehicle fuel efficiency, consolidating of urban freight, and improving the efficiency of deliveries, have to work together to define the best urban freight schemes freight requirements while decreasing environmental and social impacts.</td>
</tr>
</tbody>
</table>

| Examples | Case 59: London, United Kingdom: Delivering a road freight legacy  
|----------|-------------------------------------------------------------------------------------------------------------------------------------|
|        | Case 60: Paris, France: Sustainable deliveries of goods in Paris  
http://www.eltis.org/discover/case-studies/sustainable-deliveriesgoods-paris-france (Monoprix) |
|        | Case 61: Paris, France: Distripolis - a new city logistics solution in Paris  
|        | Case 62: Germany  
http://54.72.158.229/discover/case-studies/dhl-packstation-germany  
(PackStation) |
|        | Case 63: Berlin, Germany: Cargo Bike  
|        | Case 64: Ghent, Belgium: Cargo Case Study  
|        | Case 65: the Netherlands: Electric Cargo Bikes  
### Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th>Training Courses</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course was developed in the framework of the SOLUTIONS project. This course aims at presenting solutions to the main problems of city logistics: traffic congestion, pollution and noise, labor and safety issues and, last but not least, enhancing the quality of urban transport services for the clients and the economy.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Portal</th>
<th>In this training material the special characteristics of freight transport in urban areas or in municipal metropolitan areas are explained. As transport chains typically constitute both technically and also organisationally a unity, and the transport chains cross the geographical borders of metropolitan areas, an exclusive examination of urban freight transport is not possible.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Best practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best Urban Freight Solutions</strong></td>
</tr>
<tr>
<td>The best practice is the outcome of a European-wide logistic coordination project funded by the EU. The guide provides best practices for three thematic groups:</td>
</tr>
<tr>
<td>1) Goods vehicles access and loading in urban areas</td>
</tr>
<tr>
<td>2) Last mile solutions</td>
</tr>
<tr>
<td>3) Urban consolidation centres</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Logistics Best Practices: a handbook for Authorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The comprehensive handbook is the outcome of the Sustainable Urban Goods Logistics Achieved by Regional and Local Policies Project (Sugar) and list a wide range of case studies from Europe and analyses performance indicators and transferability.</td>
</tr>
</tbody>
</table>
This publication serves as an introduction to Sustainable Logistics. It outlines the diversity of current approaches on Sustainable Logistics, illustrates practical measures through numerous examples and shows how logistics companies and public authorities can quickly and easily reap the benefits of Sustainable Logistics.


The C-LIEGE project has developed a Position Paper of hard and soft measures for making freight and logistics systems more efficient, including financial instruments, technical and regulatory restrictions, additional services or information and communication campaigns. It also provides a detailed guide to the establishment and function of the city logistics manager role.


The EU initiated a series of measures proposed by the European Commission to promote the freight transport logistics, make rail freight more competitive, create a framework which will allow European ports to attract investment for their modernisation, put maritime freight transport on an equal footing with other transport modes and review progress made in developing Motorways of the Sea.


Low resistance tires Regulations and Standards in Europe: [http://sustainabletransport.org/?wpdmact=process&did=MTluaG90bGluaw](http://sustainabletransport.org/?wpdmact=process&did=MTluaG90bGluaw)
EU Projects on City Logistics

Overview of policy and research projects in urban freight

The EU CITYLOG project’s main objective is to increase the sustainability and the efficiency of urban delivery of goods through an adaptive and integrated mission management and innovative vehicle and transport solutions. A comprehensive report on the policy and legal environment as well as best practices has been produced:


Lamilo:

The project aims to create a step change in freight deliveries by fully considering the ‘last mile’ of a supply chain when planning a freight logistics journey, ensuring a more efficient and integrated logistics approach.


Civitas City Logistics:

CIVITAS encourages innovative approaches to efficient urban freight shipment. The CIVITAS Initiative has therefore realised 40 measures in 30 different cities on freight distribution schemes from 2002 to 2012. Read the CIVITAS highlight to learn about some of the most successful and eye-catching among these to inspire other European cities.

Case studies: [http://www.civitas.eu/freight/distribution](http://www.civitas.eu/freight/distribution)


Smartfreight:

The main aim of SMARTFREIGHT is to specify, implement and evaluate Information and Communication Technology (ICT) solutions that integrate urban traffic management systems with the management of freight and logistics in urban areas.

Project Website: [http://www.smartfreight.info/index.htm](http://www.smartfreight.info/index.htm)

Factsheet: [https://drive.google.com/file/d/0B7oEyNF3009lMWI0YjdjMmUtODAzNS00MGY4LWJkM2EtNjNkMGYzWEzZWUw/view](https://drive.google.com/file/d/0B7oEyNF3009lMWI0YjdjMmUtODAzNS00MGY4LWJkM2EtNjNkMGYzWEzZWUw/view)

Project outcome: [http://www.smartfreight.info/outcomes.htm](http://www.smartfreight.info/outcomes.htm)
Smile Project

In this context, the SMILE project aims to improve the energy efficiency of Mediterranean cities planning, sharing, promoting and testing public policies, strategies and measures for innovative intelligent solutions for urban freight distribution.

Project Website: [http://smile-urbanlogistics.eu/](http://smile-urbanlogistics.eu/)
Knowledge Platform: [http://smile-urbanlogistics.eu/members-area](http://smile-urbanlogistics.eu/members-area)

Bestfact Project

BESTFACT in this frame facilitates the exchange of best practices for freight transport:

- Identifying best practices and innovations for freight transport
- Implementation actions
- Dissemination

Website: [http://www.bestfact.net/](http://www.bestfact.net/)

Turblog

The main goal of the project is to extend, expand and transfer the existent knowledge to other countries and thus effectively contribute for the overall objective of extending the research and knowledge dissemination.

Website: [http://www.turblog.eu/](http://www.turblog.eu/)

Innovative Approaches in City Logistics

Three topics were identified by the NICHES project as innovative approaches in city logistics and described in policy notes:

- Inner-city night delivery
- Space management for urban delivery
- Alternative solutions for home delivery

Technical Paper

SourceBook on Urban Freight

This GTZ Sourcebook module describes the importance of freight transportation in the context of urban development and provides detailed information on available options to meet current and future challenges for urban goods transport in rapidly growing cities of the developing world.


Illustrations 图片

Picture: Packstation in Germany are used by 5 million customers. 1 in 10 deliveries end up at a close door. Packstations can therefore considerably use repetitive last mile delivery.
Source: Klaus Mueller (licencedCC BY SA 2.5 Wikimedia Commons)
City logistic accounts for a large share of urban traffic.
Source: Eltis
4.2.5 Traffic Management 交通管理

A. Parking Management 交通管理

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Parking Management 停车管理</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description and impact 内容和影响</strong></td>
<td>European cities have two to four off-street parking spaces for each motor vehicle (one at the owners’ home, one at their worksite, and parking spaces at other destinations such as stores), plus various on-street parking spaces. These parking facilities are costly to build and operate; an urban parking space often costs more than the vehicles that occupy it. Policies that increase vehicle parking supply often have undesirable indirect impacts by encouraging more vehicle ownership. In addition, vehicle parked on sidewalks and pathways tends to degrade walking and cycling conditions and drastically slow down public transport and hence make it less desirable as an alternative to private vehicles. More efficient parking management can significantly reduce the number of parking spaces required to serve an area. It includes more sharing of parking spaces among different users and buildings, regulations and pricing that favours higher value users for the most convenient parking spaces (such as favouring delivery vehicles and customers over employees and residents for the spaces in front of a store or factory).</td>
</tr>
</tbody>
</table>

In recent years many cities have started to apply a new parking planning paradigm (that is, a new way to define parking problems and evaluate potential solutions). This new paradigm reflects the following assumptions:

- There are many types of parking problems, including inadequate or excessive supply, too low or high prices, inadequate user information, and inefficient management.
- Parking facilities should be managed for efficiency, to maximize their value and minimize the number of parking spaces needed to serve each area.
- As much as possible, users should pay directly for parking facilities.
- Parking should be regulated to favour higher priority uses and encourage efficiency.
- Parking requirements should be flexible to reflect demands in each situation.
- Parking management solutions should be considered and applied whenever they are more cost effective than expanding parking supply.
- Intelligent Transport System technology should be implemented for easy parking process, park space availability check and quick payment options.

<table>
<thead>
<tr>
<th>Examples 案例</th>
<th>Case 66: Berlin, Germany: Parking Management Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://sustainabletransport.org/?wpdmdl=process&amp;id=OTEuaG90bGluaw">http://sustainabletransport.org/?wpdmdl=process&amp;id=OTEuaG90bGluaw</a> Feasibility Study (in German) <a href="http://sustainabletransport.org/?wpdmdl=process&amp;id=MTAwLmhvdGxpems">http://sustainabletransport.org/?wpdmdl=process&amp;id=MTAwLmhvdGxpems</a></td>
</tr>
</tbody>
</table>
Case 67: Amsterdam, Netherland: Parking Strategy

Case 68: Sofia, Bulgaria: Parking Policy
http://54.72.158.229/discover/case-studies/new-sofia-parking-policy

Case 69: Zurich, Switzerland: Parking Policy
http://54.72.158.229/discover/case-studies/parking-policy-part-comprehensive-approach-mobility-planning-zurich

Case 70: Graz, Austria: Parking Zones

Case 71: Barcelona, Spain: Parking Policy
http://www.eltis.org/discover/case-studies/barcelonas-green-parking-scheme-spain

Resources and Tools 资源和工具

Training Material
This training material was used in Eltis training sessions in 2007 and looked at how car parking spaces - both on and off street - are managed in different European Member States and the effects of this on traffic flow, congestion and pollution.

Presentation
http://www.eltis.org/sites/eltis/files/Parking_PARAMOUNT_Graz_29112007_6.ppt

Material
http://www.eltis.org/sites/eltis/files/Exercise_Developing_a_controlled_parking_zone_6.doc

Manuals
UK Department for Transport the ‘Manual for Streets’ aims to assist in the creation of accessible, attractive, and safe streets. Addressed primarily to organisations and professionals involved in transport and urban planning, the document examines street design from various perspectives, including the design process, layout, and making streets attractive places to be. Specific design issues such as parking, lighting, and traffic signage are also covered:

Manual:

Link to DOT for up-to-date manuals:
### Parking simulation tool

The SUSTAPARK project, Transport Mobility in Leuven built a simulation tool for planning parking. It is constructed as an agent-based microsimulator, in which drivers are modelled as a synthetic population. Their trips related to working, shopping, going out, et cetera are simulated, as well as their search for a parking space. The search behaviour is based on research that takes economic, cognitive, and situational factors into account when people look for a parking space.

Project page: [http://www.tmleuven.be/project/sustapark/home.htm](http://www.tmleuven.be/project/sustapark/home.htm)


### Best Practice

**Report:** The report *Europe’s Parking U-Turn*, highlights best practice in case studies of 10 cities and also sensibly addresses the wide-ranging issues which impact on and are impacted by parking policy within four digestible categories. These are:

- Economic mechanisms
- Regulatory mechanisms
- Physical design
- Quality of service contracting and technologies


### CIVITAS Project on parking management

CIVITAS fosters experimentation in demand management measures with a view to spreading lessons learned among cities. The CIVITAS cities realised 26 innovative measures on parking management in 22 different cities from 2002 to 2012. Read the CIVITAS highlight on parking to learn about some of the most successful and eye-catching among these to inspire other cities.

Follow the link to numerous case studies and best practices: [http://www.civitas.eu/demand-management/parking](http://www.civitas.eu/demand-management/parking)
Illustrations 图片

Picture: Effective on-street parking management can effectively reduce the required total parking space. The picture shows a managed area in Zürich (Switzerland). The signs indicate maximum parking time and prices. Source: Daniel Bongardt

Picture: Parking information helps to reduce searching for parking and can therefore reduce overall travel time. The picture was taken in Zurich (Switzerland) Source: Daniel Bongardt
B. Controlling Vehicle Use: Low Emission Zones (LEZ) and Congestion Charging

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Controlling Vehicle Use: Low Emission Zones (LEZ) and Congestion Charging 控制机动车的使用：低排放区和交通管制区</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Regulations restricting ownership and the utilisation of private vehicles are on the rise to improve the efficiency and quality of transport systems worldwide. Rising levels of congestion, local air pollution and greenhouse gas (GHG) emissions drive decision makers to adopt strategic policies to restrict traffic. License plate lotteries, driving bans, and peak-hour driving restrictions are gaining momentum in bigger cities. Low Emission Zones (LEZs), also called environmental zones, are a widespread measure to influence urban vehicle fleet compositions and aim at improving air quality. The concept focuses on drawing a boundary around an urban area to deter highly polluting traffic. While Low Emissions zones usually target the composition of the vehicle fleet in urban areas (increase share of clean vehicles), congestion charging aims at reducing the total amount of vehicles or trips made in urban areas.</td>
</tr>
</tbody>
</table>

| Examples 案例 | Case 72: Berlin, Germany: Low Environment Zone (LEZ)  
|---------------|----------------------------------------------------------------------------------------------------------------------------------|
|               | Case 73: London, United Kingdom: Low Environment Zone (LEZ)  
http://www.tfl.gov.uk/modes/driving/low-emission-zone |
|               | Case 74: London, United Kingdom: Proposal Ultra Low Emission Zone  
https://www.london.gov.uk/sites/default/files/ULEZ%20scrutiny%20briefing%20%E2%80%93%20February%202014.pdf |
|               | Case 75: London, United Kingdom: congestion charge  
http://www.tfl.gov.uk/modes/driving/congestion-charge |
|               | Case 76: Prague, Czech: Low Environment Zone (LEZ)  
|               | Case 77: Stockholm, Sweden: congestion charge  
|               | Case 78: EU: Overview LEZ in Europe  
http://46.22.123.170/xpo/bilagor/20030509053222.pdf |
|               | Case 79: Germany: Lesson learnt regarding LEZ  
http://sustainabletransport.org/?wpdmact=process&did=MjYuaG90bGluaw |

The CIVITAS project analysed and implemented a wide range of access restriction measures. The case studies can be accessed here:  
http://civitas.eu/demand-management/access |

<table>
<thead>
<tr>
<th>Resources and Tools 资源和工具</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
### Training Material

The MIDAS training pack provides practitioners with tools to encourage public authorities and city planners to use soft measures in promoting sustainable travel. It provides information on dissemination; education and awareness; participation and consultation; giving information, advice and marketing; planning and coordination.

Training material: [http://www.eltis.org/resources/training/access-restriction-and-environmental-zones](http://www.eltis.org/resources/training/access-restriction-and-environmental-zones)

### Guidelines

**Low Emission Zones**

The guide provides a brief introduction to the topic of congestion charging.


**Congestion Charging**

The guide serves as a decision and planning tool for policy makers who want to implement congestion charging. It draws upon experience in Europe to suggest best practices in policy development and implementation.

Policy guide Download: En/Ch [http://sustainabletransport.org/?wpdmact=process&did=MT1zLmhvdGxpbms](http://sustainabletransport.org/?wpdmact=process&did=MT1zLmhvdGxpbms)

### Database Urban Access Control Europe

The databank provides an overview of all urban restriction controls in Europe. It further specifies the scheme details such as costs, environmental standards etc.

Database: [http://urbanaccessregulations.eu/home](http://urbanaccessregulations.eu/home)
Factsheet Low Emission Zones

This factsheet provides information on the concept of LEZs and their impact analysing two European examples in Berlin (Germany) and London (UK). Furthermore, the case for Beijing is presented and suggestions for the further development of Beijing’s LEZ are given.

Fact sheet (English/Chinese):
http://sustainabletransport.org/?wpdmact=process&did=NjAuaG90bGluaw

Best Practices

International best Practices for Congestion Charge and Low Emissions Zone

This report gives a broad insight in the experiences and recommendations as well as detailed data about worldwide traffic management schemes in English and Chinese language. Case studies and examples are provided for the London, United Kingdom; Stockholm, Sweden; Milan, Italy.

Report:

However, there are doubts about the effectiveness of congestion charges. Source: Sullivan, C. 2016. Traffic congestion: is London running out of road? Financial Times. 3 October.
https://www.ft.com/content/40774fc6-76b5-11e6-bf48-b372c0b1043a

Reducing Carbon Emissions through Transport Demand Management

The report covers a whole range of transport demand management policies but provides examples and discusses success factors for LEZs and congestion charging as well.


Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities
Illustrations 图片

Picture: Road markings and road signs indicating the congestion charging area in London.
Source: Mario Roberto Durán Orti) - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons

Picture: Area C access gate. Area C is a congestion charging system in Milan.
Source: Ita140188 - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons
### C. Traffic Management and Intelligent transport systems (ITS)

<table>
<thead>
<tr>
<th>Policy/ Measures</th>
<th>Traffic Management and Intelligent transport systems (ITS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>ITS is the application of computer technology to the transport sector. ITS systems gather data about the transport system, process it, and then use the processed data to improve the management of the transport system, and/or to provide the transport user with more and better information on which to base their transport decisions. Smart technologies and Intelligent Transport Systems (ITS) in particular can significantly contribute to a cleaner, safer and more efficient transport system in urban areas. Innovative transport solutions can also meet ever-growing citizens' needs in terms of new mobility services such as car sharing and bike sharing schemes or smart ticketing solutions, for instance. ITS are key enablers to achieve public policy objectives, support the design of urban mobility and offer tailor-made measures, adapted to the wide variety of urban mobility scenarios. ITS can provide very concrete solutions, for example for traffic and travel operations and management, thus reducing congestion and its resulting negative externalities. Intelligent transport systems are usually deployed in the following fields</td>
</tr>
<tr>
<td></td>
<td>– Congestion reduction (e.g. congestion charging)</td>
</tr>
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<td></td>
<td>– Decreasing parking pressure (e.g. parking information systems)</td>
</tr>
<tr>
<td></td>
<td>– Increasing attractiveness of public transport (e.g. passenger information, fleet management)</td>
</tr>
<tr>
<td></td>
<td>– Reduce energy consumption (LEZ, green waves)</td>
</tr>
</tbody>
</table>
- Enhance road safety (vehicle-to-vehicle communication, incident detection)
- Increase transport system efficiency (e.g. traffic management)

### Examples

<table>
<thead>
<tr>
<th>Case 80: Stuttgart, Germany: Emission based traffic management</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://civitas.eu/content/emission-based-traffic-management">http://civitas.eu/content/emission-based-traffic-management</a></td>
</tr>
<tr>
<td>Presentation:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 81: Bologna, Italy: Evaluation of a new traffic management centre</th>
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</table>

<table>
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<tr>
<th>Case 82: Berlin, Germany: Traffic control centre</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://viz-info.de/documents/10122/0/VKRZ-Flyer-Englisch/c2bfb4a4-d777-42efa208-18a24a83f04c">http://viz-info.de/documents/10122/0/VKRZ-Flyer-Englisch/c2bfb4a4-d777-42efa208-18a24a83f04c</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 83: Overview of national ITS reports by several EU member state</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://ec.europa.eu/transport/themes/its/road/action_plan/its_national_reports_en.htm">http://ec.europa.eu/transport/themes/its/road/action_plan/its_national_reports_en.htm</a></td>
</tr>
</tbody>
</table>

### Resources and Tools

#### Training Material

- Guidance for urban ITS
- Traffic and Travel Information
- Traffic and Access
- Management Urban Logistics
## Legislation and Action Plan in the EU

Under Directive 2010/40/EU ([http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0040](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0040)) the European Commission has to adopt within the next seven years specifications (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across the EU. The first priorities will be traffic and travel information, the eCall emergency system and intelligent truck parking.

Further information on the action plan and directives can be found here:


Further EU funded projects for ITS:


## ITS Guidelines

Guidelines for ITS deployment in Urban Areas - Multimodal Information


Guidelines for ITS deployment in Urban Areas - Smart Ticketing


Guidelines for ITS deployment in Urban Areas - Traffic Management


## Best Practices in Urban ITS - Collection of Projects

The European Commission has promoted various research in the field of ITS. A comprehensive overview of various ITS applications has been compiled with a focus on technology solutions and best practices.

Cooperative Systems

Cooperative systems are a promising information and communication technology (ICT) based technology with a vision to deliver close to accident-free, efficient and clean road systems across Europe. Cooperative systems are the next big wave in intelligent transport systems (ITS) This document is intended for traffic managers, transport planners, urban planners and decision makers in local (and regional) authorities, and will raise awareness for the potential of cooperative systems to help meet local transport challenges.

Handbook:

Traffic Management

In the absence of a set of widely accepted performance measures and transferable methodologies, it is very difficult for a city to objectively assess the effects of specific applications (policies and technologies) and to make use of lessons learnt from other cities. The aim of the KPI report is to define a common evaluation framework for the performance of traffic management and ITS in the form of a set of Key Performance Indicators (KPIs), and to present guidelines as to its application.

KPI Report:

Best Practices

The EU funded Tide Project provides a range of innovative solutions to ITS in urban transport introduces several best practices.

Project website:

The reference material report compiles a list of technology solutions and applications in practice of ITS in urban transport.
Report:
http://transportlearning.net/competence/docs/ITS%20Telematics.pdf

The EU is currently funding multiple research projects on ITS.
Overview of research projects:
Management of bicycle traffic

Amsterdam, Netherlands: Strategy to Manage Growth of Bicycle Traffic by 2020

The world over, Amsterdam is well-known for its large number of bicycles. During the last 20 years, their number has increased by 40%, and daily some 58% of its inhabitants are riding on their bicycles a total of 2 million kilometers. Amsterdam has become one of the most bicycle-friendly cities as per the 2015 ranking (Ranking Copenhagenize). The massive use of bicycles has contributed to a reduction in traffic accidents and air pollution. The massive use of bicycles has created large bicycle parking needs occupying entire buildings at railway stations.

These bicycle parking have become a new sort of nuisance, since it is becoming difficult to find parking space. Amsterdam has tried to tackle this problem through Long-Term Bicycle Plan, under which till 2040 40,000 parking slots will be built, and 15 kms of connecting bike lines to cross the most dangerous intersections, with the protection of red painted lanes. It is anticipated that till 2020 the number of trips on bicycles to/from train stations in the city centre will increase by 25%. Bicycle trips within the city centre will increase by 10%, and those in outer areas by 5%. Among the measures to be taken, is the limitation in permitted parking time to 7-14 days, after which abandoned bicycles will be removed. Till 2020, an additional 5.300 parking slots will be created at different train stations, and 3.000 slots will be renovated below the future train station of Gustav Mahler. An additional 2.000 storage slots will be created near public bus stations, and 1.700 near the Central Amsterdam train station. The investment till 2040 will be millions.

The pricing policy applied permits free parking for the first day, and 0.5 Euro from the second day onwards.

The Dutch Junction – bicycle friendly and safe(r)

Illustrations

Picture: Traffic management System in Berlin
Source: VLZ Berlin– photographer Joerg Lange

Picture: ITS used to provide passenger information about the next arrival time. The picture shows a metro station in Paris.
Source: Daniel Bongardt
## D. Multimodal journey planning

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Multimodal journey planning</th>
</tr>
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<tbody>
<tr>
<td>联运的出行规划</td>
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| Description and impact | Multi-modal travel planning is a key element of Intelligent Transport Systems (ITS) deployment. It provides the traveller with comprehensive door-to-door information allowing for well-informed travel decisions. It seamlessly integrates information for different modes, based on a strong backbone of rail and local public transport. The speed of innovation in this field is very fast. Large companies and investors like Google and others are driving innovation and generating location-based data. |

There are several mobile apps that are providing transport solutions for a door-to-door trip with multiple modes (e.g. carsharing, bus, bike sharing, walking) given the preference of the traveller (e.g. speed, price, convenience). Apps can encourage the use of climate friendly modes by informing users on their carbon footprint or even facilitating rewards. |

| Examples | Case 84: France: destineo  
http://www.destineo.fr/en/ |
|----------|-------------------------|
| Case 85: Sweden: trafiken  
http://www.trafiken.nu/ |
| Case 86: London: Plan a Journey  
http://tfl.gov.uk/plan-a-journey/ |
| Private mobile apps:  
https://www.qixxit.de/ (Germany, Europe)  
https://www.moovel.com (Europe)  
http://www.allyapp.com/ (Europe, Latin America, Australia) |
| To find national journey planners in Europe follow this link:  

### Resources and Tools

**Training**

This course –developed in course of the SOLUTIONS project examines different aspects of multimodal journey planning and examples of what has already been achieved in Europe. Best practice cases provided here will give an impression of the state-of-the-art, and we will examine barriers that currently prevent full integration of all modes and across all borders. In this context it must be noted that multimodal information is only one part that makes up a fully integrated transport systems.

The course does not only focus on ITS! Registration required.

Course:  
Guidelines

The guideline for the implementation of Mobile Travel Information Services for the Public focuses on provision of travel information en-route for public transport users. This can be via on-board units, variable message signs, e-kiosks on street and at stations, and personal mobile devices.

Concept Sheet: http://niches-transport.org/fileadmin/NICHESplus/ConceptSheets/NICHES__ConceptSheet_3.2.pdf

ITS Action Plan Multimodal Journey Planner

The objective of the present study is to support the work towards a European multimodal journey planner, and to prepare the elaboration of functional, technical, organisational and service provision specifications.


In the framework of the EC Smart Mobility Challenge 22 ideas on innovative multimodal journey planners were developed. The list can be accessed here:

Open Data and Transport

The SUPERHUB Project provides a user-centric, integrated approach to multi-modal smart metropolitan mobility systems. The project involves designing and testing an open platform able to combine all mobility offers.
Project website: http://www.superhub-project.eu/
Trails: http://www.superhub-project.eu/shtrials.html
Pictures:
The Screenshots show the multimodal journey planning app QIXXIT. 
Left: The user chooses origin and destination. 
Middle: The desired modes can be chosen. Including walking, cycling, private car, bus, subway, trains, taxi, carsharing etc. 
Right: The app shows all possible trips depending whether the user ranks the trip’s convenience regarding total trip time, emissions, costs etc. Most trips can directly be booked with the app. 
Source: Screenshot QIXXIT App, Frederik Strompen

### E. Carsharing

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Carsharing 拼车</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact</td>
<td>Various European and North American cities adopted carsharing as part of an overall strategy to decrease private car ownership and individual transport volume in densely populated urban areas. Professionally organised carsharing services disconnect car use from vehicle ownership and complement the existing network of public and non-motorised transport modes by offering on-demand, self-service, short-term and pay-per-use access to automobiles. Based on these characteristics, carsharing unleashes the potential to reform automobile usage and to significantly contribute to a shift of mobility patterns towards more efficient and sustainable transport modes. In Europe, each carsharing vehicle can replace four to ten private vehicles and carsharing users usually reduce their VKT by 28 to 45 per cent.</td>
</tr>
</tbody>
</table>
## Case 88: London, United Kingdom: The emission impacts of Car Clubs in London


## Case 89: Carsharing in Europe and North America: Past, Present and Future

http://www.uctc.net/papers/467.pdf

### Resources and Tools 资源和工具

#### Action Plan “Carsharing for Bremen”

In Bremen over 50 Car-Sharing locations offers more than 200 cars for over 10,000 clients (February 2015). Two times Bremen was awarded by the former European Vice-President for Transport Jacques Barrot for innovative solutions in the field of mobility management: 2005 Bremen was CIVITAS city; and in 2007 Bremen achieved success with the OSMOSE award. The implemented concept of the intermodal mobil.punkt have been also awarded in the competition Improving air quality ensuring good mobility in 2006.

- **Project Website:** [http://mobilpunkt-bremen.de/](http://mobilpunkt-bremen.de/)

#### Consultation Guidance for Local Authorities

Carplus, the british carsharing association, provides best practice guidance on car clubs, designed for the benefit of local authorities, businesses, developers, policy makers and employers wishing to use, set up, promote and understand the benefits of car clubs.

- **Project Website:** [http://www.carplus.org.uk](http://www.carplus.org.uk)
- **Training material:**
  - Consultation Guidance for Local Authorities
  - Car Club Starter Pack for Local Authorities
  - Meet Policy Objectives with Low Carbon Car Clubs
  - Car Club Parking

### Momo Carsharing

The European momo project wants to increase awareness, to improve the service of Car-Sharing and to increase the energy-efficiency within the existing Car-Sharing operations. The momo consortium is composed of municipalities, Car-Sharing operators, research organisations, energy agencies and the International Public Transport Organisation UITP. Eight European countries are directly represented by the momo partners, but momo wishes to gain interest and awareness all over Europe.

Training documents, lesson learnt from the pilot project and other valuable information can be found on the project website:


### Transport for London: Car Clubs Strategy

This strategy presents Transport for London’s (TfL’s) plans for the development of car clubs in London through to 2011. It is based on consultation with key stakeholders, including operators and London boroughs, and also on market research commissioned by TfL with existing and potential car club users.

Project Website:

Training material: Car Clubs Strategy
Illustrations 图片

Picture: Carsharing station (mobil.punkt) in Bremen, Germany.
Source: Michael Glotz-Richter

Picture: car2go E-carsharing station in Stuttgart, Germany.
Source: Alexander Jung

Picture: Shared mobility in Paris, France (carsharing: Autolib'; bikesharing: Velib')
Source: Alexander Jung
### 4.2.6 Clean vehicles 清洁能源汽车

**A. Urban Electric Mobility**

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Urban Electric Mobility 城市电动出行</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description and impact 内容和影响</td>
<td>European cities face increasing challenges with local air pollution, CO\textsubscript{2} emissions and associated health effects, along with traffic congestion. EU transport depends by 95% on fossil fuels. The diversification of energy sources is essential to ensure the security of energy supply in the EU and improve local air pollution. Given this, electric vehicles (EVs) can provide substantial benefits to a sustainable urban transport system. EVs completely eliminate emissions during driving stage and are considerably less noisy compared to conventional combustion engine vehicles. Apart from that, European cities are asked to significantly contribute to greenhouse gas emission savings. Under the condition of a high share of renewables in the energy mix, EVs contribute effectively to GHG mitigation in individual transport, public transport but also new mobility services such as car- and bikesharing. While many subsidy programmes to encourage the market penetration of EVs are implemented on a national level there are many reasons and opportunities to implement complementary supportive policies on an urban level as well. Local municipalities can play several roles in promoting electric mobility.</td>
</tr>
<tr>
<td>- Administrative responsibilities: Licensing and approval of charging infrastructure, parking management</td>
<td></td>
</tr>
<tr>
<td>- Conceptual responsibilities: Infrastructure planning (number/location of charging points, public and semi-public charging), EV parking management, interchange planning</td>
<td></td>
</tr>
<tr>
<td>- Operator: Electric municipal fleet (public transport, recycling, government fleets etc.), charging infrastructure owner, e-carsharing, e-bikesharing</td>
<td></td>
</tr>
<tr>
<td>- Public communication: information campaigns, business communications, knowledge platform</td>
<td></td>
</tr>
</tbody>
</table>

To fulfil these different roles local governments have different tools at hand:

- Integration of electrification in municipal strategies, mission statements, procurement plans, local public transport plans, urban development plans, parking management plans, air quality plans, urban climate plans etc.
- Creation of responsibilities and positions for EV promotion in local administration
- Financial incentives (e.g. free parking, free access to toll roads) and non-financial incentives (e.g. low emission zones)

---

**No Combustion-Engine Cars Sold in Germany After 2030, Parliament Says**

"... Germany's Bundesrat, its upper house of parliament, passed a bipartisan resolution calling for a ban on sales of new vehicles powered by internal combustion engines, which includes both gasoline and diesel. 'If the Paris agreement to curb climate-warming emissions is to be taken seriously, no new combustion engine cars should be allowed on roads after 2030,' weekly news magazine Der Spiegel quoted Green Party lawmaker Oliver Krischer as saying. The shockwaves from this action, reported over the weekend, haven't quite hit the global auto industry or German..."
manufacturers just yet. Germany has one of the largest automotive industries in the world, and it is the biggest industrial sector in Germany. Automobile manufacturing and related businesses employ 774,900 German workers and account for one-fifth of German industry revenue. … The Bundesrat resolution would require only electric or hydrogen fuel cell vehicles by 2030, and Germany's action is likely to precipitate wider European Union policy." "We're ready for the launch of an electric product offensive that will cover all vehicle segments, from the compact to the luxury class," said Daimler AG Chief Executive Officer Dieter Zetsche at the opening of the Paris Auto Show in September. Daimler is the parent company of Mercedes-Benz. The company that invented the automobile now needs to reinvent itself.


<table>
<thead>
<tr>
<th>Examples</th>
<th>Electric vehicle strategies:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case 90:</strong> London electric vehicle delivery plan:</td>
<td><a href="http://www.london.gov.uk/sites/default/files/electric-vehicles-plan_1.pdf">http://www.london.gov.uk/sites/default/files/electric-vehicles-plan_1.pdf</a></td>
</tr>
<tr>
<td><strong>Case 91:</strong> Oslo, Norway: Urban EV policy examples</td>
<td><a href="http://www.clean-fleets.eu/fileadmin/files/documents/Stockholm_Workshop/03%20EV%20presentation%20City%20of%20Oslo%20Clean%20Fleets%20seminar%20Stockholm.pptx">http://www.clean-fleets.eu/fileadmin/files/documents/Stockholm_Workshop/03%20EV%20presentation%20City%20of%20Oslo%20Clean%20Fleets%20seminar%20Stockholm.pptx</a></td>
</tr>
<tr>
<td><strong>Case 93:</strong> Rotterdam, Netherlands: Rotterdam takes the lead in electrifying transport</td>
<td><a href="http://www.eltis.org/discover.case-studies/rotterdam-takes-lead-electrifying-transport-netherlands">http://www.eltis.org/discover.case-studies/rotterdam-takes-lead-electrifying-transport-netherlands</a></td>
</tr>
<tr>
<td>Further examples:</td>
<td><a href="http://www.clean-fleets.eu/training-and-events/workshop-stockholm/">http://www.clean-fleets.eu/training-and-events/workshop-stockholm/</a></td>
</tr>
<tr>
<td>Public transport fleet: see Position Paper “Electric, fuel cells and hybrid busses”</td>
<td></td>
</tr>
</tbody>
</table>
Resources and Tools 资源和工具

Training Material

As part of the Clean Fleets project a training programme on the EC Clean Vehicles Directive was developed and tailored towards trainers, consultants and experts in public procurement or leasing of vehicles.

- Introduction to Clean Fleets Training
- Module 1 - Purchasing clean vehicles
- Module 2 - Legislative context
- Module 3 - Approaches to Clean Vehicle procurement
- Module 4 - LCC & Practical applications of the CVD
- Module 5 - Transferring Knowledge

http://www.clean-fleets.eu/training-and-events/train-the-trainer/

Guidelines and tools

This guide is designed to assist public authorities and public transport operators in purchasing clean and energy efficient vehicles. The guide presents how environmental criteria can be introduced into the different stages of procurement procedures, together with information on life cycle costing (LCC).


Policy overview

The European automobile manufacturers association compiled a list of fiscal incentive policies for electric vehicles in the members state of the EU


The International Council on Clean Transport (ICCT) compiled a comprehensive overview of fiscal policies worldwide.

Best practices and pilot projects

The purpose of the EV City Casebook is to share experiences on EV demonstration and deployment, identify challenges and opportunities, and highlight best practices for creating thriving EV ecosystems. Cases from Europe include Amsterdam, Helsinki, Hamburg, Berlin, Stockholm, Barcelona.

EV City Casebook: https://www.iea.org/publications/freepublications/publication/EVCityCasebook.pdf

CIVITAS Initiative has realised 10 innovative measures in nine different cities on hybrid, clean and electric vehicles.

Case studies pilots: http://www.civitas.eu/clean-fuels/hybrid-electric

Case Study: EV promotion in Germany

Position Paper for Municipalities: http://starterset-elektromobilitaet.de/ (German only)

Electro-Mobility model regions and showcases: http://www.now-gmbh.de
Illustrations

Picture (left): The carsharing operator Car2go offers electric vehicles in its fleet in Berlin. Source: Daniel Bongardt

Picture (right): Picture: Engaging different key stakeholders to develop network of charging stations is key in overcoming the current obstacle for a widespread electric vehicle market penetration. The picture shows a charging point in Aachen (Germany). Source: Turelio (via Wikimedia-Commons), 2010 / Lizenziert unter CC BY-SA 3.0 de über Wikimedia Commons

Germany’s 1st Fastned EV Fast Charging Stations

First Affordable Solar Powered Vehicle – The Mö sells for about $5000

This is the Mö, the first solar vehicle which can be purchased on the market

4.2.7 Summary: EU Projects on Sustainable Transport
总结：欧盟关于可持续交通的项目

<table>
<thead>
<tr>
<th>DG Move</th>
<th>Eltis</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Directorate-General for Mobility and Transport, commonly referred to as DG MOVE, is one of the more than 40 Directorates-General and services that make up the European Commission. With growing freight and passenger transport, pollution and congestion risk is aggravating. The European Commission is working towards a form of mobility that is sustainable, energy-efficient and respectful of the environment. The website of the European Commission’s Director-General for Mobility and Transport provides a comprehensive overview of transport statistics, funding programmes, research projects and transport-related policies and legislation. <strong>Further information:</strong> <a href="http://www.ec.europa.eu/transport/">www.ec.europa.eu/transport/</a></td>
<td>Eltis facilitates the exchange of information, knowledge and experiences in the field of sustainable urban mobility in Europe. It is aimed at individuals working in transport as well as in related disciplines, including urban and regional development, health, energy and environmental sciences. Created more than 10 years ago, Eltis is now Europe’s main observatory on urban mobility. <strong>Further information:</strong> <a href="http://www.eltis.org">http://www.eltis.org</a></td>
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</table>
### Civitas

CIVITAS has helped introduce numerous innovations and measures that have already made transport more eco-friendly in over 60 European metropolitan areas dubbed demonstration cities. Thanks to an EU-funded investment of well over EUR 200 million, the project has guided cities to introduce improvements in four phases of the project, each building on previous successes. The goal is to achieve a significant shift in the modal split towards sustainable transport, an objective reached through encouraging both innovative technology and policy-based strategies.

**Further information:** [www.civitas.eu](http://www.civitas.eu)

### SOLUTIONS

The project aims to support the exchange on innovative and green urban mobility solutions between cities from Europe, Asia, Latin America and the Mediterranean. The project brings together a wealth of experience and technical knowledge from international organisations, consultants, cities, and experts involved in transport issues and solutions.

**Further information:** [http://www.urban-mobility-solutions.eu/](http://www.urban-mobility-solutions.eu/)

### Viajeo

The Viajeo project designs, demonstrates and validates an open platform which will facilitate data sharing and exchange from different sources and provide data processing and management to support a variety of services.

**Further information:** [http://www.viajeo.eu/](http://www.viajeo.eu/)

### Bestfact

The first portal of freight transport best practices, contacts and policies. The objective of BESTFACT is to develop, disseminate and enhance the utilisation of best practices and innovations in freight transport that contribute to meeting European transport policy objectives with regard to competitiveness and environmental impact.

**Further information:** [http://www.bestfact.net/](http://www.bestfact.net/)

### Smartfreight

The SMARTFREIGHT project wants to make urban freight transport more efficient, environmentally friendly and safe by answering to challenges related to traffic management, freight distribution management. The main aim of SMARTFREIGHT is therefore to specify, implement and evaluate Information and Communication Technology (ICT) solutions that integrate urban traffic management systems with the management of freight and logistics in urban areas. The actual transport operations carried out by the freight distribution vehicles will be controlled and supported by means of wireless
<table>
<thead>
<tr>
<th>Communication infrastructure and on-board and on-cargo equipment.</th>
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</thead>
<tbody>
<tr>
<td><strong>Further information:</strong> <a href="http://www.smartfreight.info/">http://www.smartfreight.info/</a></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>European Bus System of the Future</th>
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<tbody>
<tr>
<td>EBSF aims at developing a new generation of urban bus system adapted to the specificities of the European cities. EBSF acts therefore as a driver to increase the attractiveness and raise the image of the bus systems in urban and suburban areas, by means of developing new technologies on vehicles and infrastructures in combination with operational best practices.</td>
</tr>
<tr>
<td>- Innovative high quality bus system;</td>
</tr>
<tr>
<td>- Breakthrough design of vehicles, infrastructures and operations;</td>
</tr>
<tr>
<td>- Competitive position of the European bus manufacturers and operators by promoting a new concept of &quot;the European Bus System&quot;</td>
</tr>
<tr>
<td>- Boosting European research and development expertise for urban bus networks</td>
</tr>
<tr>
<td><strong>Further information:</strong> <a href="http://www.ebsf.eu">http://www.ebsf.eu</a></td>
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<table>
<thead>
<tr>
<th>NICHES</th>
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<tr>
<td>The mission of NICHES+ is to promote innovative measures for making urban transport more efficient and sustainable and to move them from their current &quot;niche&quot; position into a mainstream urban transport application. The project looks into the details of 12 innovative measures, structured in 4 thematic areas:</td>
</tr>
<tr>
<td>- Innovative concepts to enhance accessibility</td>
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<tr>
<td>- Concept for efficient planning and use of infrastructure and interchanges</td>
</tr>
<tr>
<td>- Traffic management centres</td>
</tr>
<tr>
<td>- Automated and space efficient transport systems</td>
</tr>
<tr>
<td><strong>Further information:</strong> <a href="http://www.niches-transport.org/">http://www.niches-transport.org/</a></td>
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<table>
<thead>
<tr>
<th>Transport Research and Innovation Portal (TRIP)</th>
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<tbody>
<tr>
<td>The Transport Research &amp; Innovation Portal (TRIP) gives you an overview of research activities at European and national level. The platform provides the following services:</td>
</tr>
<tr>
<td>- Project Database of 7,756 transport research related projects</td>
</tr>
<tr>
<td>- Country Profiles, presenting national institutions and organisations responsible for funding, promoting and supporting transport research</td>
</tr>
<tr>
<td>- Programmes for research and innovation in transport</td>
</tr>
<tr>
<td>- Policy Brochures presenting results of transport research according to policy topics and Transport Research Summaries on 24 transport themes</td>
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<tr>
<td>Project</td>
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<tr>
<td>---------</td>
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<tr>
<td>Clean Fleets</td>
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<tr>
<td>TIDE</td>
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<td>Polis</td>
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Further information: [http://www.polisnetwork.eu/working-groups/working-groups-2](http://www.polisnetwork.eu/working-groups/working-groups-2)
4.3 Standards

EU Environmental Standards 欧盟环境标准

Air Quality: Air quality directive 2008/50/EC: The directive on ambient air quality legislative sets out concentration level goals for different pollutants. The goal must be achieved by all EU countries. Contrary to a regulation, it is up to the EU member state how to achieve the goal. The following table shows the current standards that are derived from the directive.

Table 1: Ambient air quality derived from air quality directive 2008/50/EC

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Concentration</th>
<th>Averaging period</th>
<th>Permitted exceedences each year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine particles (PM2.5)</td>
<td>25 µg/m³***</td>
<td>1 year</td>
<td>n/a</td>
</tr>
<tr>
<td>Sulphur dioxide (SO2)</td>
<td>350 µg/m³</td>
<td>1 hour</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>125 µg/m³</td>
<td>24 hours</td>
<td>3</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO2)</td>
<td>200 µg/m³</td>
<td>1 hour</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>40 µg/m³</td>
<td>1 year</td>
<td>n/a</td>
</tr>
<tr>
<td>PM10</td>
<td>50 µg/m³</td>
<td>24 hours</td>
<td>35</td>
</tr>
</tbody>
</table>

- Case Study: The study gives an overview on which policies and measures Germany put in place to meet the goals given by the directive. [http://www.german-sustainable-mobility.de/wp-content/uploads/2014/12/CleanAir-MadeInGermany_GPSM.pdf](http://www.german-sustainable-mobility.de/wp-content/uploads/2014/12/CleanAir-MadeInGermany_GPSM.pdf)
- Case Study: Air quality in European Cities: Experience implementation of cities [http://sustainabletransport.org/?wpdmact=process&did=MjUuaG90bGluaw](http://sustainabletransport.org/?wpdmact=process&did=MjUuaG90bGluaw)
- Factsheets: This fact sheet presents compiled information based on the latest official air pollution data reported by the European Environment Agency’s (EEA) member countries. [http://www.eea.europa.eu/themes/air/air-pollution-country-fact-sheets-2014/eu-27-air-pollutant-emissions/at_download/file](http://www.eea.europa.eu/themes/air/air-pollution-country-fact-sheets-2014/eu-27-air-pollutant-emissions/at_download/file)

Noise: The environmental noise directive 2002/49/EC defines a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to the exposure to environmental noise. For that purpose several actions are to be progressively implemented. The directive demands that member state draw up noise maps and action plans for major roads, railways and airport areas to assess the number of people affected. ⁷


Clean Vehicle: The Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles (2009/33/EC) aims at a broad market introduction of environmentally-friendly vehicles. It requires that energy and environmental impacts linked to the operation of vehicles over their whole lifetime are taken into account in all purchases of road transport vehicles, as covered by the public procurement Directives and the public service Regulation.


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Project to support public administrations in the implementation of the directive: [http://www.clean-fleets.eu/about-clean-fleets/clean-vehicles-directive/](http://www.clean-fleets.eu/about-clean-fleets/clean-vehicles-directive/)

**Pollutant Emission Standards**: The emission standards for passenger vehicles are regulated under directive No 715/2007. The following pollutants are covered: Carbon monoxide, particulate matter, nitrogen oxide, hydrocarbon. A particulate number standard (P) or (PN) has been introduced in 2011 with Euro 5b for diesel engines and in 2014 with Euro 6 for petrol engines.


**CO₂ Emission Standards**: EU Regulation No 443/2009 sets an average CO₂ emissions target for new passenger cars of 130 grams per kilometre. The target is gradually being phased in between 2012 and 2015. A target of 95 grams per kilometre will apply from 2021.


**Intelligent Transport Systems**

**ITS Directive 2010/40/EU**: Under this Directive the European Commission has to adopt within the next seven years specifications (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across the EU. The first priorities will be traffic and travel information, the eCall emergency system and intelligent truck parking.


**Voluntary Planning Standards**

**Transit oriented development standard**: The TOD Standard addresses transit-adjacent developments which maximize the benefits of public transit in both developed and developing countries. “The ITDP publication outlines eight key principles for guiding a non-technical audience, everyone from developers to interested local residents, through the successful development of TODs. The TOD Standard elaborates these principles providing measurable performance objectives. The key principles are measured and rated within the categories: walk, cycle, connect, transit, mix, densify, compact, and shift. The TOD Standard is not an EU policy.


**Bus Rapid Transit Standard:** The BRT Standard design establishes a common definition of bus rapid transit (BRT) and ensures that BRT systems more uniformly deliver world-class passenger experiences, significant economic benefits, and positive environmental impacts.


**Public Transport Quality Standards**

**DIN EN 13816:** DIN EN 13816 is a European standard that was established to evaluate the quality of services provided by public transport companies. The aim is to promote quality by focusing on the needs and expectations of customers. EN 13816 is the Standard for evidencing quality capability of transport providers in public passenger traffic, which is valid all over Europe. It serves as a guideline for defining and measuring service quality in contracts for buyers and operators of public transport services.


Further information on environmental policies and regulations can be found on the following pages:


**Sustainable Urban Mobility Plans**

Instead of having separate units develop plans in their realm, the approach of sustainable urban mobility planning takes an integrated approach bringing together various stakeholders and planning experts to jointly develop long term targets. This integrated approach shall help in alleviating possible issues resulting of the complexity of modern day urban mobility and finally lead to strategies that foster cleaner and more sustainable transport modes.

The experiences of stakeholders and planning experts across the European Union have been subsumised in the concept of SUMP (Sustainable Urban Mobility Plans). The idea will overall give a guidance on how to create such a plan more than giving a detailed guideline on what need to be done in detail. However there are main elements of the approach:

- Setting accessibility of the city and its surroundings with high quality and sustainable transport means as the main objective.
- Setting clear vision long term targets in regard to infrastructure and urban development, yet also specify short term plans on implementations
- Evaluate and assess the current and future development of transport and its infrastructure
- Foster balanced mobility to create sustainable modes of transport that includes for example public transport as well as walking, cycling and motorised road transport
- Vertical and horizontal integration of government bodies and relevant authorities
- The ongoing process of SUMP implementation should continuously monitored reviewed and reported
- The planning authority in charge of the implementation process should have mechanisms that allow quality assurance.
To make the idea more clear, the European Platform on Sustainable Urban Mobility Plans has published a guideline that uses 11 steps on how SUMP may be implemented in your city. Despite not being a detailed technical guide on each step, it provided good practice example on those activities, providing information for stakeholders and decision makers.

Figure 7: The 11 steps within the four phases of the SUMP implementation process

Source: [www.eltis.org/mobility-plans](http://www.eltis.org/mobility-plans)

- The full guideline can be [downloaded from the eltis.org website](http://www.eltis.org/mobility-plans)
Further readings on tools that may be necessary in the implementation process or to tackle specific issues may be found as well on the Eltis website:

- www.eltis.org/mobility-plans/mobility-plan-tools

### 4.4 Technologies and Products

**Innovation in Urban Transport** 城市交通创新. The Transport Research and Innovation Portal has produced a brochure on behalf of the European Commission discussing innovation in urban mobility from a policy and planning perspective.


**Energy Efficient Public Transport** 高能效公共交通. Technology innovations in urban transport currently revolve around energy efficient vehicle technology. CHIC (Clean Hydrogen in European Cities) is a major European project deploying a fleet of fuel cell electric buses and associated hydrogen refuelling stations. As part of the ZeEUS project, the UITP will operate an Electric Bus Observatory which will closely monitor electric bus deployment worldwide and publish all collected information and data.


**Pilot projects:**

**Hamburg (Germany):** Designed for Hamburg’s operator Hochbahn, innovative Solaris Buses are equipped with 120 kWh batteries as the main energy provider to the drive system. They will be charged by Ballard 101 kW fuel cells during operation. A novelty is that the fuel cells are used only when 100% of output is required, which significantly increases their durability. The bus will be fuelled with hydrogen at night in the depot.


**Helsinki (Finland):** Efficient, light-weight electric buses will soon be introduced onto the streets of Helsinki thanks to an extensive pilot programme being run by Helsinki Region Transport (HSL) and the VTT Technical Research Centre of Finland.

London (UK): Transport for London announced that it is to trial innovative technology that will enable specially designed buses to wirelessly charge their batteries while they wait at bus stands. The inductive charging technology will be trialled on up to four extended range diesel electric hybrid buses in east London from next year.


Berlin (Germany): E-BUS Berlin objective is the introduction of electric vehicles featuring innovative charging techniques in public transport and the demonstration of the use of inductive charging technology during ongoing operations. Berlin’s public transport association, the BVG, intends to establish an electric bus line including an inductive charging infrastructure. The battery capacity in buses can be reduced to a size of 90 kWh, thanks to opportunity-based charging. More information Berlin Agency for Electro Mobility: http://www.emo-berlin.de/en/showcase/overview/

TIDE: The Transport Innovation Deployment for Europe extensively deals with the topic of inductive charging infrastructure in the pilot cities of Genoa and Turin (Bus), Augsburg (Tram), Lommel (joint usage of private vehicles and busses).


Other Position Papers

SUTP Position Paper
Provides an overview on standards and toolkits, Quantification tools, Design guidelines and CBAs

4.5 Indicators

Low-carbon indicators 低碳指标. The Regions for Sustainable Change project has developed a comprehensive toolkit of low-carbon indicators for use by European regions in policy making. The toolkit is designed to provide assistance in identifying, measuring, and reporting on indicators.

Users of the toolkit will be able to find guidelines on low-carbon growth and how indicators can be used; read about existing indicators at local, national and international levels; browse a thematic list and select from them to create a unique set of indicators; assess and monitor the effectiveness of policies with a questionnaire; and get inspiration from good practice examples from European regions.

Toolkit: http://www.rscproject.org/indicators/

Audit and certifications scheme 审计和颁发证书. The ADVANCE project developed and audit scheme that helps cities evaluating their sustainable urban mobility plans (SUMPs). The audit is a tool that analyses the strengths and weaknesses in the current sustainable mobility
planning of a city and gives clear indications for improvement. Measures and areas of actions to improve the sustainable mobility planning in the city can be derived directly from the action plan that results from the audit process. The action plan can be used as a basis for an updated plan.

- **Audit Guideline:**  
  [http://eu-advance.eu/docs/file/d2_5_final_advance_audit_scheme_including_guidelines_en.pdf](http://eu-advance.eu/docs/file/d2_5_final_advance_audit_scheme_including_guidelines_en.pdf)

**Clean Air Scorecard** 清洁空气得分榜. The Clean Air Scorecard is an excel-based tool to improve air pollution and GHG emissions management based on three indices: (1) Air Pollution and Health Index; (2) Clean Air Management Capacity Index; (3) Clean Air Policies and Action Index. The latest version also incorporates indicators on: (i) regional air quality management; (ii) policy enforcement effectiveness rate; (iii) inventory of air quality management tools and models. The overall clean air score provides a quick snapshot on the overall status of clean air management in a city. It specifically accounts for the transport sector within the overall assessment.

- **Scorecard:** [http://cleanairasia.org/portal/scorecard](http://cleanairasia.org/portal/scorecard)

**Measuring Public Transport Performance** 公共交通评价体系. This paper describes the role that performance measurement can play in public transportation planning and management, the need for developing cities to start adopting performance evaluation and the steps for initiating this. It provides examples of successful public transport performance evaluation systems from across the globe, including developing cities that are beginning to explore these systems, and identifies key factors necessary for creating successful evaluation systems.


**Ten goals for a competitive and resource efficient system: benchmarks for achieving the 60% GHG emission reduction target.**

Developing and deploying new and sustainable fuels and propulsion systems

(1) Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂-free city logistics in major urban centres by 203010.

(2) Low-carbon sustainable fuels in aviation to reach 40% by 2050; also by 2050 reduce EU CO₂ emissions from maritime bunker fuels by 40% (if feasible 50%11).

Optimising the performance of multimodal logistic chains, including by making greater use of more energy-efficient modes

(3) 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.

(4) By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.

(5) A fully functional and EU-wide multimodal TEN-T 'core network’ by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.
(6) By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.

**Increasing the efficiency of transport and of infrastructure use with information systems and market-based incentives**


(8) By 2020, establish the framework for a European multimodal transport information, management and payment system.

(9) By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.

(10) Move towards full application of “user pays” and “polluter pays” principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.


**ITS and Traffic Management Key Performance Indicators** 智能交通系统和交通管理评价指标. Cities today face many common transport problems and implement similar urban traffic management solutions, with Intelligent Transport Systems (ITS) playing a prominent role. However, in the absence of a set of widely accepted performance measures and transferable methodologies, it is very difficult for a city to objectively assess the effects of specific applications (policies and technologies) and to make use of lessons learnt from other cities. The aim of this report is to define a common evaluation framework for the performance of traffic management and ITS in the form of a set of Key Performance Indicators (KPIs), and to present guidelines as to its application.


**Emission inventories in European Cities**

Tool: Emission inventories and scenario development

**Balancing Transport GHG Emissions in Cities**

The report describes the calculation of transport GHG emissions, central influencing factors on calculated emissions as well as a range of methodological aspects. Emission factor databases and inventory models used in Europe are explained. Additionally a short comparative overview on emission factor databases and models outside of Germany is given.

Download:
- English [http://sustainabletransport.org/?wpdmact=process&did=MS5ob3RsaW5r](http://sustainabletransport.org/?wpdmact=process&did=MS5ob3RsaW5r)
- Chinese [http://sustainabletransport.org/?wpdmact=process&did=MTcuaG90bGluaw](http://sustainabletransport.org/?wpdmact=process&did=MTcuaG90bGluaw)

See also:
4.6 Lessons Learnt from Pilot Projects

1) Low-emission vehicles

**Germany Electric vehicle pilot projects**: The German Federal Ministry of Transport compiled a comprehensive analysis of the EV pilot projects in the electro mobility model region in Germany. Goals of support programme for the market and technological preparation of electro mobility. The model regions in Germany cover the following topics:

- Technologically open research and development (R&D) for
- battery-powered electric vehicles
- Every day, user-oriented trials
- Integration in mobility, spatial and urban development
- Local networking between agents from the relevant industries,
- science and the public sector
- Results-oriented exchange on umbrella platforms

The evaluation report looks at the current status and lesson-learnt from the different regions.


**United Kingdom**: Lesson learnt from “Strategy for Ultra Low Emission Vehicles in the UK”. The UK Office for Low Emission Vehicles has drafted a strategy on governmental support for the market penetration of ultra-low emission vehicles (technology-independent). In Chapter 5 the lessons learnt from projects and strategies so far are comprehensively described.


**Norway:** The Norwegian government has been at the forefront of promoting EV promotional policies in Europe. This has resulted in impressive numbers. In 2014 36% of all EVs in Europe were sold in Norway.

The report presents an analysis of the ongoing battery electric vehicles (BEV) revolution in Norway focusing on the measures that have been introduced to support a modal shift away from the conventional combustion engine car.

Different policy measures, BEV infrastructure and EV technology developments and their coherence are examined. Lessons learnt from these policies are described at the end of the report.

2) **Public Transport** 公共交通

**Interchanges:** Urban interchanges are subject to several analyses initiated by the European Commission due to the growing interest in the development of urban areas, the growing urbanisation trends, population characteristics as well as other socioeconomic targets; among others these could involve reducing car-dependencies, improving quality of life, improving transport system efficiency, developing better business models and other sustainability targets. The importance of well-designed interchanges in achieving these targets is obvious. In the City-HUB project, a set of pilot case studies have been used to assess good and bad practice and improvement potential. The lessons learnt from these case studies are presented in the “lesson-learnt report”. The aim of this document is to present the pilot case studies and describe the main good and bad practices that have been identified in these cases.

The selected pilot case studies are: Moncloa, Madrid (Spain), Ilford Railway Station, London (United Kingdom), Railway Station Thessaloniki (Greece), Kamppi, Helsinki (Finland), Köbénya-Kispest, Budapest (Hungary)
- Lesson learnt report: http://www.cityhub-project.eu/Portals/0/D2.3_Lessons%20from%20descriptive%20case%20studies.pdf
- Project website: http://www.cityhub-project.eu/

3) **Cycling** 自行车

In some European countries such as Denmark, the Netherlands and parts of Germany and Belgium, cycling is already acknowledged as a serious transport mode, but in much of Europe, cycling is still more potential than reality. In order to unlock this potential, PRESTO was helping to remove barriers by building competence in cycling policies to enable a real cycling culture
to develop in cities all across Europe. The lessons-learnt brochure describes the tools developed and the lessons learnt from the cycling pilot cities in the following policy fields:

- General cycling framework
- Cycling infrastructure
- Promotion of cycling
- Electric bicycles


4) City Support Programme CIVITAS 城市支持项目

With the CIVITAS Initiative, the European Commission aims to generate a decisive breakthrough towards sustainable urban mobility by supporting cities that adopt ambitious and innovative transport strategies. More specifically, CIVITAS is helping cities become key actors in the innovation process by providing them with support for testing integrated packages of new urban transport technologies and services prior to their broad deployment. Since 2002, CIVITAS has supported 59 cities across Europe in the implementation of more than 730 innovative urban mobility measures.


A number of relevant policies and applications in the transport field have emerged, which can be summarized as follows:

**Table 2: Urban Transport Policies and Packages**
<table>
<thead>
<tr>
<th>Area of Activity</th>
<th>Basic Package Minimum requirements</th>
<th>Advanced Package Standard approaches</th>
<th>Deluxe Package Premium low carbon approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Make roads people friendly</strong></td>
<td>• Provide side walks</td>
<td>• Establish pedestrian and bicycle short cuts</td>
<td>• Public bicycle scheme</td>
</tr>
<tr>
<td></td>
<td>• Reduce barriers such as bridges, underpasses and fences</td>
<td>• Diverse street environment</td>
<td>• Shared space concepts</td>
</tr>
<tr>
<td></td>
<td>• Introduce speed limits</td>
<td>• Trees along roads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide bicycle lanes</td>
<td>• Separated networks for bicycles and pedestrians (bicycle avenues)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Manage parking demand</strong></td>
<td>• Prohibit side walk parking</td>
<td>• Replace minimum with maximum requirements for parking places for cars</td>
<td>• Reduce/limit number of parking spaces in urban areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide minimum requirements for parking spaces for bicycles</td>
<td>• Zero parking (except for special needs) in new developments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pricing for existing parking places</td>
<td></td>
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<td>• Pricing for existing parking places</td>
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<tr>
<td><strong>5. Move to high quality public transit</strong></td>
<td>• Make public transport clean and convenient</td>
<td>• Integrated ticketing / fares</td>
<td>• Comprehensive bus rapid transit system</td>
</tr>
<tr>
<td></td>
<td>• Increase speed through priority signalling</td>
<td>• Information / marketing</td>
<td>• Urban rail network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Green procurement of vehicles</td>
<td>• Full integration of public transport modes and with non-motorised transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bus-only lanes along high-density areas</td>
<td>• Full integration with land-use</td>
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<tr>
<td></td>
<td></td>
<td>• High quality interchange (Design of stations to have short transfer times)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Level boarding, and off-bus/metro fare collection to speed up transit</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>6. Provide inclusive information</td>
<td>• Information campaigns</td>
<td>• Cooperation with companies (e.g. bike parking)</td>
<td>• Travel information (Web 2.0)</td>
</tr>
<tr>
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</tr>
<tr>
<td>7. Reap the benefits of technological advancement</td>
<td>• Incentives to promote clean fuels and vehicles</td>
<td>• Use of Intelligent Transport Systems</td>
<td>• Full prioritisation of public transport and non-motorised transport through priority signalling and ITS</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>8. Change the role of cars</td>
<td>• Speed limits</td>
<td>• Reduce investments in car oriented roads</td>
<td>• Limitation of access to city centres</td>
</tr>
<tr>
<td>---------------------------------</td>
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<td>-----------------------------</td>
</tr>
<tr>
<td>9. Reinvent mixed-used, high density cities</td>
<td>• Retain and reinvent dense urban fabric (mixed-use structures)</td>
<td>• Land use regulation (e.g. restriction of greenfield shopping)</td>
<td>• Advanced integration of land-use and transport into planning</td>
</tr>
<tr>
<td>---------------------------------</td>
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<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>10. Create/Live in urban spaces</td>
<td>• Wide side-walks</td>
<td>• Urban greening (shadow trees, lakes and rivers, diversity (of buildings, people, infrastructure)</td>
<td>• Adapted architecture</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
</tbody>
</table>

4.6.1 Good Practices - Illustrations

**Avoid:**

<table>
<thead>
<tr>
<th>Avoid overdependence on car-based transit modes</th>
<th>Avoid traditional and polluting technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Avoid Car-Based Transit" /></td>
<td><img src="source" alt="Avoid Traditional Technologies" /></td>
</tr>
</tbody>
</table>

**Shift:**

<table>
<thead>
<tr>
<th>Shifting from road-based to rail-based systems</th>
<th>Public transport, goods delivery, private transport and pedestrians in Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Shift Rail-Based Systems" /></td>
<td><img src="source" alt="Shift Public Transport" /></td>
</tr>
</tbody>
</table>
### Improve:

<table>
<thead>
<tr>
<th><strong>Growing popularity of tram systems, using electricity</strong></th>
<th><strong>The Bus Rapid Transit of Metz – diesel-electric hybrid driving system</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Tram System" /></td>
<td><img src="image2.png" alt="Bus Rapid Transit" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Vauban in Freiburg, Germany</strong></th>
<th><strong>Electrical car</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Vauban Tram" /></td>
<td><img src="image4.png" alt="Electrical Car" /></td>
</tr>
<tr>
<td>Source: Florian Steinberg</td>
<td>Source: Florian Steinberg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>The come-back of the trams in Europe – introducing innovate green designs</strong></th>
<th><strong>Smart Transport Management in London, United Kingdom</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5.png" alt="Tram System" /></td>
<td><img src="image6.png" alt="Smart Transportation System" /></td>
</tr>
</tbody>
</table>
**Congestion Charges, London, United Kingdom**

Source: [en.wikipedia.org/wiki/London_congestion_charge](en.wikipedia.org/wiki/London_congestion_charge)

**Boundaries of Congestion Zone – Central London, United Kingdom**

Source: [en.wikipedia.org/wiki/London_congestion_charge](en.wikipedia.org/wiki/London_congestion_charge)

**Traffic Management System being developed by COOPERS, a European research initiative**


**Road smart management and Speed Limits**

Source: Sensys British Columbia Ministry of Transportation, [rhinocarhire.com](rhinocarhire.com)
Non-Motorized Transport for Tourists, Berlin, Germany

Source: Florian Steinberg

Electrical Motorbike

Source: BMW

Secure bicycle lanes in London, United Kingdom


London: Proposed cycle super highways making bikes the transport of the future

### Methane Gas Powered Buses, Bristol, United Kingdom

Source: http://www.dailymail.co.uk/wires/pa/article-2995269/Poo-bus-set-passenger-service.html#ixzz3USs9mJx1

### New CO2-Neutral Buses in Copenhagen


### 4.7 Outlook

Mainstream transport planning in Europe has, by contrast to the US, never been based on assumptions that the private car was the best or only solution for urban mobility. For example the Dutch Transport Structure Scheme has since the 1970s required that demand for additional vehicle capacity only be met "if the contribution to societal welfare is positive", and since 1990 has included an explicit target to halve the rate of growth in vehicle traffic. There are major differences in transport energy consumption between cities; an average U.S. urban dweller uses 24 times more energy annually for private transport than a Chinese urban resident, and almost four times as much as a European urban dweller. These differences cannot be explained by wealth alone but are closely linked to the rates of walking, cycling, and public transport use and to enduring features of the city including urban density and urban design.

The cities and nations that have invested most heavily in car-based transport systems are now the least environmentally sustainable, as measured by per capita fossil fuel use. The social and economic sustainability of car-based urban planning has also been questioned. Within the United States, residents of sprawling cities make more frequent and longer car trips, while residents of traditional urban neighbourhoods make a similar number of trips, but travel shorter distances and walk, cycle and use transit more often. A less car intensive means of urban transport is carsharing, which is becoming popular in North America and Europe, and carsharing can reduce car ownership at an estimated rate of one rental car replacing 15 owned vehicles. Car sharing has also has begun in the developing world, where traffic and urban density is often worse than in developed countries. Companies like Zoom in India, car2go in China, and Carrot in Mexico, are bringing car-sharing to developing countries in an effort to reduce car-related pollution, ameliorate traffic, and expand the number of people who have access to cars. Many other cities throughout the world have recognised the need to link sustainability and transport policies, for example by joining Cities for Climate Protection.  

Access and mobility are fundamental enablers of development. Unfortunately, as rapid urbanization has led to rapid private motorization, the preferred chosen form of mobility,

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specifically cars and motorcycles, has ironically resulted in less access and mobility. Congestion, contamination, and road deaths are increasingly a defining feature of modern cities, and especially those cities of the developing world.

The alternative transport pathway for green cities is achieved through designing away the need for private motorized transport in the first place. The framework of Avoid-Shift-Improve articulates both the contents and priorities that seem to best present such an alternative. A synergistic package of mixed-use development, integrated spatial planning, quality public transport and non-motorized transport facilities, disincentives to car and motorcycle use, and clean vehicle technologies offers a way forward towards Green Cities. The market-driven nature of car-free communities, such as Vauban in Germany, means a percentage of the population indeed prioritize quality-of-life in choosing living options.

In Europe many cities have been dominated for long by car-friendly policies. However, as a result of the green development, the pedestrians, bicycle users and those who do not (want to) own cars, have started to claim their fair share of the cities’ public space. Thus, different interest groups debate today their access to the urban city. It is the perspective of sustainable green transport against the ‘car city’ advocates which matters today.  

City leaders have more power than they realise. Transportation policy has enormous bearing on a city’s success and on issues of fairness, prosperity, and safety. Mayors must recognize that cities hold substantial power over transportation, because they control how the street is used and how new developments connect with transportation systems. Leaders who link transportation accomplishments to broad goals can improve life for their citizens while winning public acclaim.

“Installing dedicated bus lanes, building pedestrian-friendly streets, and reaching Vision Zero; it’s the kind of talk that tickles the urbanist’s fancy. But it takes so much to implement even the smallest of transit improvements that it’s easy for mayors and other city officials to avoid it all, afraid that they’re at the mercy of state and federal governments. But when it comes down to it, all transportation is local.” Cities can establish actions which make transport working for their citizens, with cycling and walking as viable options.

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10 http://transitcenter.org/publications/atil/
Copenhagen – Beijing: A comparison --- From Car City to Bicycle City, and vice-versa

<table>
<thead>
<tr>
<th>Copenhagen</th>
<th>Beijing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>1950</td>
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<tr>
<td>1995</td>
<td>1984</td>
</tr>
<tr>
<td>2010</td>
<td>2010</td>
</tr>
</tbody>
</table>


Energy, Transport and GHG Emissions

The EU report “Energy, Transport and GHG Emissions” describes the reference scenario analysis 2013. The report defines in detail the assumptions in terms of economic development, population growth, environmental policy, transport demand and technological progress until 2050. The scenario was elaborated using the PRIMES model for energy and CO₂ emission projections with several supporting specialised models (e.g. Tremove for transport [projections].

5 PERSPECTIVES FROM CHINA

5.1 Sector Context and Policy Analysis

Although China has become the world’s largest automobile market in 2009, its average level of motorisation is still low. With currently 58 private passenger cars per 1,000 citizens, there is a significant disparity in private car ownership between China and developed countries such as Germany (588 cars per 1,000 citizens) and the USA (786 cars per 1,000 citizens). Despite the overall low motorisation, rising car ownership concentrates in Chinese megacities and metropolitan regions, where it turned from an economic driving force into a major climate and environmental concern. Severe air pollution, inefficient land use, high congestion levels, increasing parking demand and traffic accidents are far reaching consequences, which accompany the unprecedented growth over recent decades. In addition, greenhouse gas (GHG) emissions related to urban transportation have become a key challenge for sustainable development in China.

Considering the government’s aim to further accelerate the level of urbanisation from currently 53.7 per cent to 60 per cent in 2020 paired with the continuous increase in population and per capita income, urban mass motorisation is unlikely to stop anytime soon. Recent projections from the School of Environmental Studies of Tsinghua University, one of China’s leading academic institutions, forecast a four to six fold increase in private passenger cars until 2030. This would add at least 250 to 450 million more cars to the already clogged streets of Chinese cities.

Legal Basis. The legal basis for the transport sector is the existing urban planning legislation of the People’s Republic of China (PRC), and other guidelines of the Ministry of Housing, and Urban-Rural Development (MoHURD), particularly those pertaining to eco-city development. The relevant legal reference documents are:

- Land Management Law. 1998. And based on the law, the detailed Enforcement Regulation has been developed, and undergone revisions for several times. The latest is the 2014 version.

Specifically for the Green Transport Sector:


**New Urbanization Policy 2016.** Following the Central Urban Work Conference (20-21 December 2015) on 6 February 2016, the Communist Party of China Central Committee and the State Council issued a roadmap for city development. Green transport is included under urban services:13

- **Complete urban public service.** The development of public transport enjoys priority. Until 2020, the share of super- and ultra-large public transport will reach 40%. 14

**China Development Bank Capital (CDBC) Policy for Green Urban Development.** The CDBC´s policy document for Green Urban Development states several principles for the green transport sector:

- **Transit-oriented Development:** Cities should be built around their public transit systems. The area within 500-800 meters of major transit stations, such as the metro or bus rapid transit (BRT), or within 500 meters of nearest bus or transit stops (in case BRT or Metro is not available) should have FAR at least 50% higher than the average of the district. For big cities, at least 70% of residents should live in TOD areas characterized by convenient mass transit service. Great accessibility (pleasant walking amenities to transit system within 500-meter radius) must be offered).

- **Non-motorized Transit:** There should be dedicated and connected walking paths of at least 10Km in length per square kilometer, and dedicated and connected biking paths of at least 10 km in length per square kilometer in urban areas.

- **Public Transit:** All new developments must be within a 500-meter radius of a bus or rapid transit station. For the city as a whole, at least 90% of developments should be within 800-radius of a public transit station.

- **Car control:** Every city should have a strategy to cap car use. Where high-quality transit exists, there should be limits on parking.

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13 Extracted and translated from: [http://www.gov.cn/zhengce/2016-02/21/content_5044367.htm](http://www.gov.cn/zhengce/2016-02/21/content_5044367.htm)

14 See debate about this issue in China Daily [http://www.chinadaily.com.cn/china/2016-02/22/content_23593906.htm](http://www.chinadaily.com.cn/china/2016-02/22/content_23593906.htm)
Figure 8: Transport Sector Investment Demand Estimate in the 13th Five Year Plan (2016-2020)

Table 3: Relationship between Smart and Green Guidelines

<table>
<thead>
<tr>
<th>Smart Guidelines</th>
<th>Relevant Green Guidelines</th>
<th>Relationship</th>
<th>Relevant Smart Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Mobility</td>
<td>Transit-oriented Development</td>
<td>These smart technologies can use data to help people find the best route and integrate various modes of transportation to reach their final destination. Higher density areas are much easier to navigate when cities implement these technologies in conjunction with transit-oriented development.</td>
<td>Smart Bike-sharing Systems, Smart Traffic Management and Congestion Pricing, Smart Parking, Transit Data and Smart Payment</td>
</tr>
<tr>
<td></td>
<td>Mixed-use</td>
<td>Mixed-use neighborhoods make travel distances much shorter and more walkable by having clear commuting districts. However, smart bike-sharing systems can offer a faster way to get to locations outside the neighborhood but within the commuting district.</td>
<td>Smart Bike-sharing Systems</td>
</tr>
<tr>
<td>Non-motorized Transit</td>
<td></td>
<td>A great transit system integrates various transit options to allow users to optimize their routes—in other words, it is multi-modal. People are also more likely to combine walking with public transit, or biking with public transit, if transit systems offer accurate information and accessible payment systems. Smart bike-sharing systems can making biking more attractive and improve the bike-rail connection.</td>
<td>Smart Bike-sharing Systems, Transit Data and Smart Payment Systems</td>
</tr>
<tr>
<td>Public Transit</td>
<td></td>
<td>Smart mobility technologies improve public transit services, increase ridership, and improve energy efficiency of public transit systems.</td>
<td>Transit Data and Smart Payment Systems</td>
</tr>
<tr>
<td>Car Control</td>
<td></td>
<td>In addition to improving public transit or non-motorized transit systems to encourage people to</td>
<td>All Smart Mobility technologies</td>
</tr>
</tbody>
</table>

drive less, smart parking can price parking more appropriately or shift more driving to off-peak hours through dynamic pricing.

| Small Blocks | Smaller blocks (hence more intersections) combined with smart traffic management system increases the flexibility in timing traffic signals to alleviate congestion and also adds more potential intervention points if the city chooses to use congestion pricing. | All Smart Mobility technologies |


**Metro systems.** Currently there are 15 rapid transit systems in mainland China.15 A further 18 systems are under construction and 20 more metros are planned.16 With the ¥4 trillion economic stimulus package all currently existing subway systems are undergoing massive expansion, with many new systems being under construction or planned. The Beijing Subway, which opened in 1969, currently has 15 lines, 218 stations and 372 km (231 mi) of subway track and will grow to about 1,000 km by 2020. The Tianjin Metro was begun in 1970 as a planned network of 153.9 km (96 mi) on seven lines, the current existing system contains 2 lines and 26.18 km (16 mi) of track with 22 stations. Shanghai Metro, which opened in 1995, as of end of 2010 has twelve lines, 233 stations, and 420 km (261 mi) of track in operation, making it the longest metro system in the world. Further expansion plans call for a network of 887 km of track. The Guangzhou which opened in 1997 has five lines (as of 2010), 144 stations and has 236 km with an additional 400 km planned to be completed by 2020. The Shenzhen Metro opened in 2004, initially with two lines, 19 stations, and 21.8 km of track, after 2010 it had over 70 km, by June 2011 it had expanded to 177 km of operational metro.

**Bus rapid transit (BRT).** More than 30 projects are being implemented or studied in some big cities.17 Another 9 BRT systems are not yet operational but under construction. But the lack of separated bus lanes in some cities make it harder to achieve the (high) speed as expected. As of 2013, trolleybuses provide a portion of the public transit service in 10 Chinese cities. At one time, as many as 27 cities were served by trolleybuses, comprising 28 systems, as Wuhan had two independent trolleybus systems. The Shanghai trolleybus system, which remains in operation, opened in 1914 and is the longest-lived trolleybus system in the world. All other trolleybus systems in China opened after 1950.

**Innovations in Electro-mobility.** China’s central government rolled out a plan in 2012 to boost its electric vehicle industry, calling for producing 500,000 electrical and hybrid cars by 2015, with output of both types of vehicles slated to grow to 2 million units by 2020. But battery performance remains the greatest threat to the credibility of electric vehicles in motorists’ eyes as Chinese companies still lag far behind their competitors in the West in battery technology. The other common concern is a lack of recharging stations. By end of 2014, 88 cities in China

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15 Cities that have a metro system: Beijing Subway, Changchun Light Rail Transit, Chengdu Metro, Chongqing Rail Transit, Dalian Metro, Foshan, Guangzhou Metro, Hangzhou Metro, Kunming Rail Transit, Nanjing Metro, Shanghai Metro, Shenyang Metro, Shenzhen Metro, Suzhou Metro, Tianjin Metro, Wuhan Metro, Xi’an Metro.
16 Metro systems under construction: Changsha Metro, Changzhou Metro, Fuzhou Metro, Guiyang Urban Rail Transit, Dongguan Rail Transit, Harbin Metro, Hefei Metro, Qingdao Metro, Nanchang Rail Transit, Nanning Rail Transit, Ningbo Rail Transit, Wenzhou Metro, Wuxi Metro, Zhengzhou Metro.
17 Operational BRT systems can be found in: Hangzhou, Beijing, Kunming, Changzhou, Xiamen, Jinan, Zaozhuang, Zhengzhou, Guangzhou, Suzhou, Dalian, Chongqing, Hefei, Yancheng, Urumqi, Changde, Lianyungang, Lanzhou, Yinchuan, and Chengdu.
were promoting the use of new energy vehicles, and 70 had released detailed policies offering a range of subsidies for acquisition of such vehicles (between 31,500 to 180,000 yuan).\(^\text{18}\)

“But … the Legislative Affairs Office, which reports to the Chinese cabinet, … [has informed in 2017] … that all manufacturers will be required to generate EV credits that equal 8% of sales in 2018, 10% by 2019, and 12% by 2020. The rule applies to both foreign and domestic car makers. The credits are computed based on the level of electrification of the cars produced. Fully electric cars earn more credits than plug-in hybrid cars, for example. Plug-in cars that go further on battery power alone are rewarded with more credits than cars that have more limited electric range. … China's growing middle class is buying more and more automoiles, which exacerbates air pollution problems. Making more of those cars operate on electricity is a top priority of the Chinese government.”\(^\text{19}\)

“Green” vehicles in China, are proving popular, but their growth is undermined by an immature infrastructure and a lack of charging stations. (Poor facilities pulling the plug on electric cars, in China Daily, 16 February 2015). In 2013, within China some 74,000 new energy (=electric) vehicles were sold in China, and the country is now the world’s largest market for green vehicles.

**Emission standards.** Emission inventories and GHG accounting in urban transport are legal requirements governing air pollutants released into the atmosphere. Emission standards set quantitative limits on the permissible amount of specific air pollutants that may be released from specific sources over specific timeframes. They are generally designed to achieve air quality standards and to protect human health. Chinese transport and city planners can use the China Road Transport Emission Model to estimate road transport-related gas emissions and air pollutants based on the European Handbook for Emission Factors (HBEFA) that was developed by GIZ and partners. The methodology of the HBEFA allows to identify the most effective measures to reduce transport emissions.

Due to rapidly expanding wealth and prosperity, the number of coal power plants and cars on China's roads is rapidly growing, creating an ongoing pollution problem. China enacted its first emissions controls on automobiles in 2000, equivalent to Euro I standards. China's State Environmental Protection Administration (SEPA) upgraded emission controls again on July 1, 2004 to the Euro II standard. More stringent emission standard, National Standard III, equivalent to Euro III standards, went into effect on July 1, 2007. Plans are for Euro IV standards to take effect in 2010. Beijing introduced the Euro IV standard in advance on January 1, 2008, became the first city in mainland China to adopt this standard.

**Urban resilience:** The current phenomena of climate change make it imperative to introduce aspects of climate change adaptation into many infrastructure sectors. This also is true for the transport sector. In the green transport sector this would mean measures to ensure that transport services are not interrupted during extreme weather events.

**Smart management of services.** In these times of rapid modernization many urban service sectors are also improving and modernizing their management techniques through advances in information technology (internet communication; online services; surveillance cameras

\(^{18}\) Poor facilities pulling the plug on electric cars, in: China Daily, 16 February 2015.

\(^{19}\) Hanley, S. 2017. China: 12% Electric Cars By 2020 … Or Else. 16 June 2017. [https://cleantechnica.com/2017/06/16/china-12-electric-cars-2020-else/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+IM-cleantechnica+%28CleanTechnica%29](https://cleantechnica.com/2017/06/16/china-12-electric-cars-2020-else/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+IM-cleantechnica+%28CleanTechnica%29)
etc.), which helps to make services more efficient, more accessible and more affordable. For the green transport sector this would go beyond conventional monitoring of transport flows and transport bottlenecks. It could cover a more proactive demand management of public transport facilities, including information to passengers through public displays about departures and arrivals, differentiated pricing during peak hours and lean times.  

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Traffic congestion. Traffic congestion has become a serious problem for many cities in China in recent years, spreading from large ones such as Beijing to many second- and third-tier cities. … "In recent years, the increase in vehicles has far outpaced the development of transportation infrastructure in many places in China, causing chronic traffic congestion." There were 126 million private vehicles in China by the end of last year, a year-on-year increase of 15.5 percent, according to the National Bureau of Statistics. Thirty-five cities in China each had more than 1 million cars at the end of last year, including 10 that had more than 2 million cars, according to Beijing News. Some cities facing the worst traffic congestion, including Beijing and Shanghai, have taken strict measures in recent years to discourage people from buying and using cars, such as requiring prospective buyers to obtain licenses through lotteries or auctions. Thus, cities need to develop public transportation systems that can handle large passenger volumes, such as subways, to relieve the traffic burden…
"Subway construction is progressing rapidly in many cities in China, but time is needed for such facilities to be completed and put into use".  

**General assessment of importance of green transport.** UNEP has confirmed in its assessment of the transport sector that (i) the present car-dominated patterns of transportation, based mainly on petrol and diesel-fuelled motor vehicles, generate serious social, environmental and economic damages and are highly unsustainable; (ii) "business-as-usual" will significantly enlarge the vehicle fleets and exacerbate their costs to society; (iii) A three-pronged investment strategy is needed to transform this sector: promote access instead of mobility; shift to less harmful modes of transportation; and improve vehicles towards lower carbon intensity and pollution; (iv) investment in public transportation and vehicle efficiency improvements generates exceptional economic returns; and (v) enabling conditions for green transportation have to be wide-ranging in order to be effective, covering policies, financing of public transport and non-motorized transportation, applying new green transport technologies, and increasing capacity of institutions to foster green transport.  

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**Sustainable Transport in China**

The [www.sustainabletransport.org](http://www.sustainabletransport.org) website serves as a knowledge and information sharing platform on the Sino-German projects on sustainable transport. It covers the topics of:

1. Urban Transport
2. Climate Change
3. Electric Vehicles
4. Green Logistics

The website provides several presentations, training material and case studies on the above topics.  
More information: [www.sustainabletransport.org](http://www.sustainabletransport.org)

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**China Urban Transport Center (城市交通)**

The online portal [www.chinautc.com](http://www.chinautc.com) was set up jointly by the three entities:

- Urban Transport Center, Ministry of Housing and Urban-Rural Development
- China Metro & LRT Research Center, MOHURD
- Urban Transport Institute, China Academy of Urban Planning and Design

It shall act as an exchange platform for professionals, academics, universities and the industry about developments concerning urban and transport planning. It shall facilitate information sharing as well as fostering technological development.


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MoHURD identified three policy measures:

<table>
<thead>
<tr>
<th>Promote joint development of transport and land use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning should take the lead in coordinating resource allocation and land use in order to improve urban spatial and industrial structure, such that necessary trips can be significantly reduced.</td>
</tr>
<tr>
<td>Implement ToD, in order to lead the clustering of urban functions at transit corridor or hubs, as well as encourage residents to use bicycle for short-distance trips.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Improve transport infrastructure with focus on green transport development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve the existing infrastructure, and set advantages for public transport, walking and cycling in land and taxation policy.</td>
</tr>
<tr>
<td>Optimize the function and structure of urban road network, and improve its connectivity and accessibility</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjust the management of mobility needs to local conditions and provide rational guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combine the management of mobility needs and infrastructure development</td>
</tr>
<tr>
<td>&quot;Car Free Day&quot; of Chinese cities</td>
</tr>
</tbody>
</table>

Source (content) [http://www.mohurd.gov.cn/bldjgzyhd/201309/t20130912_215033.html](http://www.mohurd.gov.cn/bldjgzyhd/201309/t20130912_215033.html) (summary and translation)

**Sustainable Transport Programme.** In China, transport accounts for a significant share of total carbon emissions, representing a significant challenge to sustainable development. Recognising the challenges of rapid urbanization and motorization, China has committed to limit the growth of its green house gas (GHG) emissions. Through the implementation of green transport policies, China is aiming to improve urban air quality, reduced congestions, and improved road safety. Applying the Avoid-Shift-Improve approach, China promotes alternative mobility solutions and develops sustainable modern transport systems in its public transport.23 Among these are underground metro systems, guided rapid bus transit (BRT) systems, innovations in motor vehicles, and non-motorized transport networks (for instance for bicycles).24 In international comparison, Transport policies in China are considered as strong and well oriented due to their commitment to green growth and heavy investment, as the Asian Green Cities index study has found out.25  ➔**Tool GT 1**

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## 5.2 Best Practices

Table 5: Transport Demand Management - travel impacts and relevance for Chinese cities

<table>
<thead>
<tr>
<th>Sustainable Urban Transport Policies</th>
<th>Travel impacts and GHG reduction</th>
<th>Relevance to Chinese cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transit service improvements</td>
<td>Increases modal share of public transit and reduces car-driving for all travel purposes GHG reduction most effective, if implemented city-wide</td>
<td>Almost all Chinese cities upgrade their public transit systems. But in many of them, the overall travel-chain from-door-to-door does still not provide high levels of convenience.</td>
</tr>
<tr>
<td>Walking and cycling improvements (non-motorised transport)</td>
<td>Increases modal share of walking and cycling for short distance trips (up to 5 km) and reduces car-driving for all travel purposes GHG reduction especially high, if implemented in mixed-use city quarters or as feeder to public transit</td>
<td>Traditionally non-motorised modes were strong in China. Currently walking and cycling lack a positive image in society and infrastructure for bikes has been reduced. However, it is still better than in many other countries and there is a strong trend toward electric bikes.</td>
</tr>
<tr>
<td>Corporate Mobility Management programmes</td>
<td>Reduces automobile travel especially for commuting GHG reduction especially high, if major employers participate</td>
<td>Many employers in China do not yet apply corporate mobility programmes. A growing number of Chinese companies develop environmental or sustainability strategies.</td>
</tr>
<tr>
<td>Parking management and pricing</td>
<td>Reduces automobile travel GHG reduction most effective, if implemented city-wide and high quality public transit systems are in place</td>
<td>Parking is a key challenge in many Chinese cities. First steps have been taken but it still is a long way to comprehensive parking strategies. The growing numbers of automobiles require urgent action.</td>
</tr>
<tr>
<td>Efficient road pricing</td>
<td>Reduces urban-peak automobile travel, especially for commuting GHG reduction highly depending on zone where applied</td>
<td>Congestion pricing is so far not implemented in Chinese cities. There might be some potential in very congested areas, especially if combined with vehicle restrictions.</td>
</tr>
<tr>
<td>Vehicle restrictions</td>
<td>Reduces automobile travel in certain times or areas GHG reduction highly depending on time when or zone where applied</td>
<td>Many Chinese cities have experience with vehicle restrictions that are increasingly connected to fuel types (e.g. exemptions for EVs)</td>
</tr>
<tr>
<td>Smart growth land use policies</td>
<td>Shifts modes and reduces vehicle travel (VKT) simultaneously GHG reduction especially high in a long-term perspective of more than 10 years</td>
<td>Many Chinese cities are auto-oriented and separate living and working. Considering the rapid growth of urbanization (up to 15M people move to cities every year) such strategies are of utmost importance.</td>
</tr>
</tbody>
</table>


→ Tool GT 3, → Tool GT 4
## 5.2.1 Good Practices - Illustrations

### Avoid

<table>
<thead>
<tr>
<th>Car City</th>
<th>Shanghai - mixed-use design enables a high-quality living environment by placing public amenities in close proximity to one another</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Car City" /></td>
<td><img src="source" alt="Shanghai" /></td>
</tr>
</tbody>
</table>

Source: Florian Steinberg

Shift

<table>
<thead>
<tr>
<th>Guangzhou Bus Rapid Transit</th>
<th>Bus Rapid Transit in Lanzhou, China</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Trolley Bus in Beijing</th>
<th>High Speed Train</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Florian Steinberg</td>
<td>Source: Florian Steinberg</td>
</tr>
</tbody>
</table>
### Improve

<table>
<thead>
<tr>
<th>Beijing Underground</th>
<th>Beijing Underground</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Beijing Underground" /></td>
<td><img src="image2" alt="Beijing Underground" /></td>
</tr>
<tr>
<td>Source: Florian Steinberg</td>
<td>Source: Florian Steinberg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electronic Road Pricing in Singapore</th>
<th>Wireless electronic device for payments under Road Pricing Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Electronic Road Pricing in Singapore" /></td>
<td><img src="image4" alt="Wireless electronic device" /></td>
</tr>
<tr>
<td>Electronic Toll Collector (ETC)</td>
<td>All-in-one Card for public transport</td>
</tr>
<tr>
<td>--------------------------------</td>
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</tr>
<tr>
<td><img src="http://cache.baiducontent.com/c?m=9d78d513d9d706ef06e2ce364b54c0678a499d267992cc7150885c913cf37011a123ca6e86c3510738298237a5d80c1df7f0347134e7b499c8c41cabbbe56a75ca&amp;p=8979e54ad4df1175e052ef6f254f05&amp;newp=c3769a478f0c16eb08e29e7c5fc92695803edd33dd4d5c2083d7&amp;user=baidu" alt="ETC image" /></td>
<td><img src="http://info.cs.hc360.com/2013/06/20101794839.shtml" alt="Card image" /></td>
</tr>
<tr>
<td><img src="http://cache.baiducontent.com/c?m=9d78d513d9d706ef06e2ce364b54c0678a499d267992cc7150885c913cf37011a123ca6e86c3510738298237a5d80c1df7f0347134e7b499c8c41cabbbe56a75ca&amp;p=8979e54ad4df1175e052ef6f254f05&amp;newp=c3769a478f0c16eb08e29e7c5fc92695803edd33dd4d5c2083d7&amp;user=baidu" alt="ETC image" /></td>
<td><img src="http://info.cs.hc360.com/2013/06/20101794839.shtml" alt="Card image" /></td>
</tr>
</tbody>
</table>

**Electronic Toll Collector (ETC)**

Source: http://cache.baiducontent.com/c?m=9d78d513d9d706ef06e2ce364b54c0678a499d267992cc7150885c913cf37011a123ca6e86c3510738298237a5d80c1df7f0347134e7b499c8c41cabbbe56a75ca&p=8979e54ad4df1175e052ef6f254f05&newp=c3769a478f0c16eb08e29e7c5fc92695803edd33dd4d5c2083d7&user=baidu

**All-in-one Card for public transport**

Source: http://info.cs.hc360.com/2013/06/20101794839.shtml

**Electric car in China**

Source: China Daily 15 February 2015

**The Transrapid Shanghai Maglev Train, with a top speed of 431 km/h - the first and only commercial line in the world**

Source: en.wikipedia.org/wiki/Transport_in_the_People%27s_Republic_of_China
## 5.2.2 Transit Improvements 提升公共交通品质

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Transit Improvements 公共交通提升方案</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description 内容</td>
<td>Public transport can be a cost-effective and efficient alternative to individual private modes without compromising on mobility. As China covers a vast area and has a large population, the public transport system is of considerable national importance. There is a huge network of bus and train routes connecting cities and towns across the country, and the Chinese government has invested heavily in updating and improving the transport infrastructure in recent years. In 2012, Ministry of Transport of China (MOT) initiated the national “Transit Metropolis” pilot project, which aims to easing traffic jams by improving public transport services in China’s cities. At the moment, 37 pilot cities are selected and more cities will be added to this programme in the thirteenth five year plan.</td>
</tr>
</tbody>
</table>

### Examples 案例:

- **Case 94: Official website of MOT Transit Metropolis Programme**

  Regulations, standards, and pilot projects could be found in this site.

### Resources and Tools 资源和工具:

- **Ministry of Transport Guidelines**
  Urban Public Transport Planning Guidelines issued by MOT in 2014

- **Action Plan**
  Improving Public Transport in Chinese Cities: Elements of an Action Plan
China Urban Passenger Transport Development Annual Report

This report provides a systemic overview of the passenger transport development across different types of cities in China.


Low-carbon and sustainable transport in Qingdao: A strategic study

Working with Qingdao Municipal Government, WRI China/EMBARQ China assessed Qingdao’s current measures to pursue low-carbon transport in four inter-connected areas: transport policy, institutional structure, finance and perception and awareness. This working paper includes 5 recommendations to help Qingdao achieve the sustainable development of its transportation sector.


Reform Proposal on Public Transport Authorities

This working paper aims to a) provide a deepened understanding of how existing urban transport institutions fail to facilitate the development and implementation of sustainable transport policies, and b) generate a set of practical recommendations on institutional reform of municipal transport authorities to address these shortcomings.

http://www.wricities.org/research/publication/shaping-sustainable-urban-transport-authorities-china
Financing Public Transport

In the framework of the Sino-German Sustainable Urban Transport Programme the current urban transport financing scheme in China was reviewed. An international workshop on sustainable funding resulted in a number of policy recommendations for China:

Discussion Paper (Chinese/English)

Workshop Report (Chinese/English)
http://sustainabletransport.org/final-workshop-summary-report-on-financing-sustainable-urban-transport/

Financing International Review (Chinese/English)

Urban Transport Financing Presentation
http://sustainabletransport.org/sustainable-financing-for-urban-public-transport-in-china/


Beijing plans huge buses that can drive above cars

Source: 3D Express Coach: China Plans Huge Buses That Can Drive Over Cars. 2 August 2010.
http://www.huffingtonpost.com/2010/08/02/3d-express-coach-pictures_n_667452.html
Busses stuck in mixed traffic in Shenzhen. Busses can only compete as an alternative to a private car if they can provide a high quality service. As long as the advantage of taking a bus is purely financial, a modal shift to private vehicles continues with economic development.
Source: Daniel Bongardt

Beijing heavily invested in the subway system. Modern and clean stations, improved coverage and convenient ticketing have improved the system considerably in the last years.
Source: Daniel Bongardt
The Chinese high-speed railway network has been extended vastly and provides a convenient and fast connection between many cities in China.

Source: Daniel Bongardt

According to the NDRC, the country had an operational rail length of 121,000 km by 2015, and 19,000 km of that was high-speed. By the end of 2020, the country wants to add another 11,000 high-speed rail lines, bringing the total high-speed railway lines to 30,000 km, according to information by the Ministry of Transport. “By the end of 2020, more than 80 percent of mainland cities with populations of at least 1 million will be covered by high-speed railways.”

China has built the world’s largest bullet-train network

Source: China has built the world’s largest bullet-train network. And there’s a lot more to come. But is it a waste of money?
5.2.3 Mobility Management 出行管理

A. Parking Management

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Parking Management 停车管理</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description 内容</td>
<td>A perceived lack of available parking spaces in most Chinese cities has not only lead to parking search traffic, longer travel times, but also illegal parking on curb sides, bicycle lanes or driving lanes. It is challenging the movement of pedestrians, cyclists and public transport and reduces the quality of life in Chinese cities. The question remains whether there is indeed a parking shortage or just inadequate parking management. In fact, the challenge of parking in Chinese cities is a complex which involves a series of expertise such as policy making, urban and transport planning, construction, operation and management of parking infrastructures. Existing parking management policy in China are listed as following:</td>
</tr>
<tr>
<td></td>
<td>- Parking requirements</td>
</tr>
<tr>
<td></td>
<td>- Parking price</td>
</tr>
<tr>
<td></td>
<td>- Enforcement</td>
</tr>
<tr>
<td>In most Chinese cities, parking requirements are minimum standard which describe the basic responsibility of property developers to provide at least such numbers of parking spaces when constructing a new building or redevelop an old one. Charging parking facilities (on-street/off-street) is a widely implemented parking policy in Chinese cities, but the price varies from city to city. The latest on-street parking price reform in Shenzhen charges 15 RMB for the 1st hour and makes it the most expensive in China. Although parking pricing policies exist for quite a long time, the street chaos, traffic congestion caused by parking becomes more and more severe. One of the important factors is parking enforcement. Generally speaking, the parking enforcement is weak even in the capital city Beijing. Different institutions split the 'enforcement responsibility' apart and each takes one piece of cake, which makes the enforcement very complex in Chinese cities.</td>
<td></td>
</tr>
</tbody>
</table>

⇒ Tool GT 3
Resources and Tools 资源和工具:

Parking Guidebook for Beijing

This guidebook provides detailed insights into Beijing’s parking issues and offer recommendations to improve on-street and off-street parking policies and systems.


Case Study Beijing

This report is based on a case study of parking management in a residential compound in Beijing and offers suitable recommendations to parking management in Beijing. It highlights good parking management should be the first step to alleviate parking chaos even if there is a real parking shortage. It also offers six relevant parking policies which can be adapted to the local context in Beijing.

http://sustainabletransport.org/?wpdmdl=3084

Review of Parking Decentralization and Governance Practice for Beijing.

This report review of key issues in decentralization and metropolitan governance for large cities. It also reviews of some previous work on parking responsibilities for each level of government. In addition, it shows some insight on the balance of role between the private and public sectors in parking.

http://sustainabletransport.org/?wpdmdl=3085
Parking Guidebook for Chinese Cities

This guidebook looks at international strategies from many regions and offers recommendations that can be adopted in any Chinese city experiencing increased motorization and perceived parking shortages. The guidebook offers eight strategies for cities to improve their parking situation. These recommendations illustrate how handling on-street and off-street parking in harmony with transportation policy objectives can help any city achieve its long-term goals. A special section focusing on Guangzhou serves as a case study of one particular Chinese city coming to grips with how to approach growing motorization and the seemingly unyielding demand for parking in the best possible way.

ITDP, 2014.

Parking Management Opportunities for Shenzhen.

This report focuses on parking management for inner and central areas of Shenzhen. It discusses the approach to ease traffic congestion through parking policy is neither remove on-street parking nor build more parking spaces first try parking management. It also mentioned price as a management tool to response to demand and pointed out the limitation of price cap in the local price control.

Paul Barter, 2013.
http://sustainabletransport.org/?wpdmdl=3086

Parking Management for Shenzhen.

This report is a summary of feedback on Shenzhen parking reform in 2014. In includes the expert’s comments on the results of the on-street parking pricing efforts so far, on the continuing discussion over the possible Off-Street Adjustment Fee, on certain other parking management questions that arose during the mission, as well as pointers to other relevant information resources.

Paul Barter, 2014.
http://sustainabletransport.org/?wpdmdl=3006
Illustrations 图片

Picture: Parking enforcement is crucial for any effective parking management strategy
Source: Daniel Bongardt

Picture: Limited mobility and convenience for certain groups of people caused by poor parking management
Source: Daniel Bongardt

B. Controlling Vehicle Use

<table>
<thead>
<tr>
<th>Policy/Measures</th>
<th>Controlling Vehicle Use 控制汽车使用</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description 内容</td>
<td>The rapidly growing number of motorized vehicles in China put a high pressure on the cities transport systems. At the same time, greenhouse gas emissions and local air pollutants as well as external costs of traffic congestion are increasing. Neither the provision of additional road infrastructure nor the development of new car technologies alone can</td>
</tr>
</tbody>
</table>
overcome all these challenges. A sustainable solution to the cities’ traffic problems can only be achieved by implementing travel demand management (TDM) strategies which not only reduce total emissions, but can also help reduce traffic congestion, facility costs, consumer costs, and traffic accidents.

At the moment, various “PUSH” TDM measures have been implemented in Chinese cities to reduce road congestion and emissions.

- Licence plate lottery or auction system.
- Private vehicles driving ban.
- Road pricing/congestion charging. Efficient road pricing includes road tolls (a toll for driving on a particular roadway), priced lanes (one lane that is priced to minimize congestion on an otherwise un-priced but congested highway) and cordon fees (a toll for driving into an area, such as a downtown area).
- Car free zone

Examples

<table>
<thead>
<tr>
<th>Case 95: Beijing: Traffic Reduction through Limited Car Circulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>For example, Beijing introduced a quota system in 2011 for license plates to regulate the increasing number of private cars. Under the quota system, only 240,000 license plates were issued through a lottery system. Shanghai have been implementing the license plate auction system for more than 10 years, and Guangzhou, Shenzhen etc. have also introduced this scheme to control the quick increase of private cars. Driving ban for private vehicles could be based on license plate number, such as in Beijing, or by region/road type, such as in Shanghai. Congestion charging is still one of the policy options in the basket of Beijing TDM measures.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 96: Bike Rental schemes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since a few years, Chinese cities and the private sector have introduced bike rental schemes. Some work with fixed parking stations, others use independent systems.</td>
</tr>
</tbody>
</table>

Examples

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>For example, Beijing introduced a quota system in 2011 for license plates to regulate the increasing number of private cars. Under the quota system, only 240,000 license plates were issued through a lottery system. Shanghai have been implementing the license plate auction system for more than 10 years, and Guangzhou, Shenzhen etc. have also introduced this scheme to control the quick increase of private cars. Driving ban for private vehicles could be based on license plate number, such as in Beijing, or by region/road type, such as in Shanghai. Congestion charging is still one of the policy options in the basket of Beijing TDM measures.</td>
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</tr>
</tbody>
</table>

Bikes for rent in Beijing
Source: Florian Steinberg

The *Mobike* system is one such scheme which uses a digital application (app) to locate and rent out bicycles. The app is being used to pay the rental fees. However, the absence of fixed parking stations has caused problems.
of uncontrolled disposal of bikes. The authorities have reacted to this and collected unutilized bikes in the city of Shenzhen.

Hangzhou abuzz over bike sharing

“In Hangzhou, East China’s Zhejiang province, a bike-sharing service moved a step closer to embracing the mobile internet era by enabling anyone with a smartphone to rent a bike by simply scanning a QR code. Many people say that Hangzhou is a city where you can survive with only a cell phone — everything can be paid for via mobile payment apps, including Alipay or WeChat Pay. …with the scanning of a QR code enabling access to free biking almost anywhere in the city. An official app can be downloaded, but even without one, you will be fine, as long as you have the WeChat app on your phone, which has almost become a must-have for anyone living in China. For now, 100 stations around the West Lake area have been upgraded to enable mobile renting, but more are to follow. First-time users only need to scan the QR code beside the bike, register via text message, pay a refundable deposit of 500 yuan ($75) and start riding, according to Tao Xuejun, general manager of Hangzhou Public Bicycle Service. As one of China’s first cities to promote modern bike-sharing services back in 2008, Hangzhou is renowned globally and has been ranked by international news media outlets such as the BBC and USA Today as the most friendly city for bike sharing. As of May [2016], Hangzhou had 84,100 public bikes at 3,572 stations around the city. In populated areas surrounding West Lake, a station can be easily found every 500 meters or so. On average, 310,000 people use the service on a daily basis, with the peak daily volume reaching 448,600, according to official statistics.”

Chinese city gets world’s longest aerial cycle way

The city of Xiamen in south-east China has just completed the longest aerial cycleway in the world. The path is a 4.8m-wide four-lane carriageway stretching for 7.6km with 11 exits connecting to six public transport hubs. Xiamen’s commuters do not have to have a bike to use the system, as it comes with 355 cycles for hire, and has 253 parking spaces for private bikes on seven platforms. Much of the pathway is beneath the elevated road used by the city’s rapid transit bus line, which gives shelter on rainy days. For safety, the paths have 1.3m guardrails and 30,000 lights to illuminate the path at night.


Xiamen’s elevated bicycle lanes

http://english.cctv.com/2017/01/24/ARTIveglVand11g2PoR5quK7170124.shtml
## Resources and Tools

### Policy Example
Beijing Vehicle Licence Plate Lottery System official website. Information on the current regulations are readily available
http://www.bjbjyd.gov.cn/

### LEZ Factsheet Example Beijing
In 2009, Beijing implemented a LEZ within the 5th ring road focusing on vehicles that cannot meet the Euro I emission standard (so called yellow-label vehicles). At the end of 2008, 350,000 vehicles did not meet this standard (most of them were heavy-duty trucks).

The factsheet compares the legislation in Beijing, Berlin and London.

Factsheet:
Chinese [http://sustainabletransport.org/?wpdmdl=3047](http://sustainabletransport.org/?wpdmdl=3047)
English [http://sustainabletransport.org/?wpdmdl=3046](http://sustainabletransport.org/?wpdmdl=3046)

### Congestion Management for China’s Transit Metropolises (2014)
Focused on international experiences this report subsumes research on traffic reduction measures, such as congestion charging. It additionally provides advice on creating strategies for developing policy and strategy frameworks.
The report uses London, UK; Stockholm, Sweden and Singapore as examples.
[http://sustainabletransport.org/?wpdmdl=3066](http://sustainabletransport.org/?wpdmdl=3066)

### Vehicle Control Measures
Smart Strategies for Private Vehicle Ownership and Usage in Chengdu is a transportation project of WRI China/EMBARQ China, funded by the Caterpillar Foundation. The working paper draws on the experience of Chinese and international cities, such as Beijing, Shanghai, Guangzhou,

Congestion Charges in Beijing

“… Beijing’s policymakers will follow in the footsteps of London and Singapore in their efforts to ease traffic and cut down on air pollution, though details have not been announced. …[It is]… estimated that the congestion fee could be 20 to 50 yuan (US$3.50 to US$7.60).” For many citizens this will be a considerable amount.

Car Sharing in China

As experience in Europe and North America shows, many nations adopted carsharing as part of an overall strategy to mitigate the negative impacts of increasing private car ownership and individual transport volume in densely populated urban areas. Professionally organised carsharing services separate car use from vehicle ownership and complement the existing network of public and non-motorised transport modes by offering on-demand, self-service, short-term and pay-per-use access to automobiles. Based on these characteristics, carsharing unleashes the potential to reform automobile usage and to significantly contribute to a shift of mobility patterns towards more efficient and sustainable eco-modes – A change that appears to be a necessity to reduce air pollution and space consumption in Chinese megacities.

While the impact of carsharing on urban transport and environment is gaining growing importance on an international scale, carsharing systems in China are still in an initial phase. Since comprehensive large-scale carsharing systems could contribute to the sustainable development of China’s urban transport sector, the GIZ Working Paper “Carsharing in China – A Contribution to Sustainable Urban Transport?”, prepared and published by the Sino-German Cooperation Project on Electro-Mobility and Climate Protection, aims to raise the overall awareness of this mobility service as well as to give an insight into...
the functionality, the positive impacts and the feasibility of carsharing services in China. → Tool GT 3


<table>
<thead>
<tr>
<th>Impact Assessment of Vehicle Electrification on Regional Air Quality in China and Climate Impact Assessment of Electric Vehicles 2050</th>
</tr>
</thead>
</table>
| The development of electric vehicles (EVs, plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs)) could enhance fuel diversity and utilise renewable energy, which is considered a promising, long-term solution to reduce high dependence on fossil fuels and alleviate climate change impacts from a global perspective. In addition, EV deployment is considered capable of improving urban air quality by reducing on-road emissions for traffic-populated areas. Chinese policymakers are aware of the potential environmental benefits of EVs in lessening urban atmospheric pollution. Decade-long discussions regarding whether fleet electrification can deliver actual environmental benefits on a regional scale have been heated during recent years.

Life cycle assessment (LCA) methods were applied to determine the well-to-wheels (WTW) reduction benefits of energy consumption and emissions of greenhouse gases and air pollutants through electro-mobility. During the initial phase of the project, the full life cycle energy consumption and emissions of CO₂ and major air pollutants for light-duty and heavy-duty vehicles at national and regional levels in China were estimated to the year 2030. This provides massive policy implications to policymakers in terms of EV promotion. Moreover, these results are in a complex pattern and vary considerably by the power generation mix and vehicle technology. Based on this, the report aims to delve deeper from two different perspectives: methodology and timeframe.

The major purposes of the project were to:

1. Evaluate the impacts of fleet electrification scenarios on air quality in the Yangtze River Delta and the Jing-Jin-Ji regions through the application of a comprehensive air quality model, and propose recommendations on how electro-mobility in China can provide win-win strategies in both climate and environmental protection.

2. Update and extend the energy consumption and emission databases of different vehicle propulsion technologies, design vehicle stock and composition, Vehicle Kilometres Travelled (VKT), and fleet electrification scenarios with a long-term perspective until 2050.”

Illustrations 图片

Picture: Beijing has implemented a range of push measures such as driving bans and pull measures such as investment in the subway network
Source: Daniel Bongardt
5.2.4 Clean Vehicles 清洁能源汽车

<table>
<thead>
<tr>
<th>Policy/Measures 政策/手段</th>
<th>Clean Vehicles 清洁能源汽车</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description 内容</td>
<td>The Ministry of Transport sets forward an ambitious plan for electric vehicles in China. By 2020, 200,000 city buses and 100,000 Taxis shall be pure EVs, and the share of NEVs in public transport and city logistic shall be over 30%. Sales of electric vehicles have quadrupled in 2014 with 83,900 electric vehicles sold, compared to the previous year. Almost 110,000 electric vehicles in China have been approved. Official market forecasts suggest that the sales will increase 10 times by 2020. The support policies for electric vehicles have been extended and the existing subsidy and incentive measures have been added and updated:</td>
</tr>
<tr>
<td></td>
<td>- The fiscal incentives will still play an important role. However purchasing subsidy will be reduced to 10% per year in the future.</td>
</tr>
<tr>
<td></td>
<td>- In January 2014, the responsible Chinese authorities issued new evaluation criteria for the financial support to electric vehicles (new: range on pure EV mode; former: battery capacity).</td>
</tr>
<tr>
<td></td>
<td>- In addition, China has exempted EVs from number plates authorization auction (Shanghai) and the lottery draw for new registrations (Beijing).</td>
</tr>
<tr>
<td></td>
<td>- Beijing is considering to limit the issuing of new car number plates.</td>
</tr>
<tr>
<td></td>
<td>- The expansion of the charging infrastructure is financially supported. In November 2014, the Chinese government issued new regulations to subsidize the development of charging facilities for electric vehicles. This means that the central government will directly transfer subsidies to the respective city governments proportional to the number of electric vehicles registered in the municipality.</td>
</tr>
<tr>
<td></td>
<td>- In addition, mandatory guidelines for increasing the share of electric vehicles in public fleets were published.</td>
</tr>
</tbody>
</table>

Tool GT 3

Case 97: Low-Speed EVs Are Driving High-Speed Urbanization In China

As nations around the world struggle to halt the Earth’s rising temperature, China has made the transition to low-carbon transport a priority. As part of the effort to develop low-emission vehicles, national electric car manufacturers have enjoyed significant support from the Chinese government. Yet their sales are dwarfed by those of a pint-sized competitor: the low-speed electric vehicle.
Despite the name, low-speed electric vehicles (LSEVs) aren’t actually that slow. With a top speed of 60km/h, they’re fast enough for getting around big and heavily congested cities. Most models are compact, resembling three-wheeled utility vehicles or golf buggies—a practical solution for the dire lack of parking spaces that have become a significant problem more and more people take up driving in China.

https://cleantechnica.com/2017/01/06/low-speed-evs-driving-high-speed-urbanization-china/

### Resources and Tools 资源和工具

<table>
<thead>
<tr>
<th>Local EV Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase subsidies, EV Taxis and Buses subsidies, charging facilities standards and battery recycle policies are explained on the below websites</td>
</tr>
<tr>
<td>Examples:</td>
</tr>
<tr>
<td>Shanghai: <a href="http://www.shanghai.gov.cn/shanghai/node2314/node2319/node2404/n32349/n32351/u26ai39569.html">http://www.shanghai.gov.cn/shanghai/node2314/node2319/node2404/n32349/n32351/u26ai39569.html</a></td>
</tr>
<tr>
<td>Beijing: [<a href="http://www">http://www</a> bjxnyqc.org/](<a href="http://www">http://www</a> bjxnyqc.org/)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guidelines and Local EV information for Chinese cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The COMPASS Guidelines describe a wide range of policy instruments available for city administration to promote electric vehicles in an urban environment.</td>
</tr>
<tr>
<td>The compass website give information on local policies and EV statistics.</td>
</tr>
<tr>
<td>Both, Guidelines and Website will be available from June 2015. <a href="http://www.ev-cities-china.org">www.ev-cities-china.org</a></td>
</tr>
</tbody>
</table>
Autohome

An online encyclopaedia about vehicles and car industry. Here you will find a large amount of industrial standards, promotion policies about cars in China, and most important figures in the car industry. In the NEV section you can find policies about EV promotion on national level and provincial level.


Further resources

Online Video Training Courses
http://www.d1ev.com/open/

Policy list
http://www.d1ev.com/33353.html


Illustrations 图片

Picture: E-Taxi in Shenzhen
Source: Daniel Bongardt
Beijing: Largest Charging Station in Asia in Operation - Beijing LIVAT in Fengtai District

Users can access the charging station through several APPs in their mobile phones. Payments are made through UEEE app, WeChat, Alipay, Apple Pay etc. It costs 1.3 CNY per kWh, and another 0.8 CNY per kWh for the service. It takes 4 to 5 hours to charge a car by slow charging module, and only 1 hour by fast charging module.

According to the data from Beijing New Energy Auto Development Center, until September 2016, the number of charging poles in Beijing reached 50,700, among which 6,700 are for buses, 9,000 open for the public, 35,000 restricted for use by employees of institutions.

5.3 Standards
China enacted its first emissions controls on automobiles in 2000, equivalent to Euro I standards. China's State Environmental Protection Administration (SEPA) upgraded emission controls again on July 1, 2004 to the Euro II standard. More stringent emission standard, National Standard III, equivalent to Euro III standards, went into effect on July 1, 2007. Plans are for Euro IV standards to take effect in 2010. Beijing introduced the Euro IV standard in advance on January 1, 2008, became the first city in mainland China to adopt this standard.

Table 6: Fuel Economy Standards in China:

<table>
<thead>
<tr>
<th>Vehicle curb mass(kg)</th>
<th>Standards for regular vehicles(L/100km)</th>
<th>Standards for special-featured vehicles(L/100km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phase I</td>
<td>Phase II</td>
</tr>
<tr>
<td>CM≤750</td>
<td>7.2</td>
<td>6.2</td>
</tr>
<tr>
<td>750&lt;CM≤865</td>
<td>7.2</td>
<td>6.5</td>
</tr>
<tr>
<td>865&lt;CM≤980</td>
<td>7.7</td>
<td>7.0</td>
</tr>
<tr>
<td>980&lt;CM≤1090</td>
<td>8.3</td>
<td>7.5</td>
</tr>
<tr>
<td>1090&lt;CM≤1205</td>
<td>8.9</td>
<td>8.1</td>
</tr>
<tr>
<td>1205&lt;CM≤1320</td>
<td>9.5</td>
<td>8.6</td>
</tr>
<tr>
<td>1320&lt;CM≤1430</td>
<td>10.1</td>
<td>9.2</td>
</tr>
<tr>
<td>1430&lt;CM≤1540</td>
<td>10.7</td>
<td>9.7</td>
</tr>
<tr>
<td>1540&lt;CM≤1660</td>
<td>11.3</td>
<td>10.2</td>
</tr>
<tr>
<td>1660&lt;CM≤1770</td>
<td>11.9</td>
<td>10.7</td>
</tr>
<tr>
<td>1770&lt;CM≤1880</td>
<td>12.4</td>
<td>11.1</td>
</tr>
<tr>
<td>1880&lt;CM≤2000</td>
<td>12.8</td>
<td>11.5</td>
</tr>
<tr>
<td>2000&lt;CM≤2110</td>
<td>13.2</td>
<td>11.9</td>
</tr>
<tr>
<td>2110&lt;CM≤2280</td>
<td>13.7</td>
<td>12.3</td>
</tr>
<tr>
<td>2280&lt;CM≤2510</td>
<td>14.6</td>
<td>13.1</td>
</tr>
<tr>
<td>2510&lt;CM</td>
<td>15.5</td>
<td>13.9</td>
</tr>
</tbody>
</table>

5.4 Indicators
Achieving the Key Performance Indicators of the Sino-Singapore Tianjin Eco-City (SSTEC) for the green transport of 90% - with 60% using public transport, and 30% walking or cycling – may be attainable under today’s transport patterns, particularly given the high-share of non-motorized transport and the wide acceptance of public transport. 27 Notably, the SSTEC transport indicators do not (yet) have specific sub-indicators for leading-edge, low-emissions technologies in the bus fleet, private motor cars, and commercial vehicles. Such standards could promote “green” vehicles throughout the SSTEC community, and could provide information on social and financial affordability, like the journey costs, transportation

expenditures as percentage of income. For the measurement of financial sustainability of the public transport system, indicators such as the ration of operating costs (recurrent costs divided by operating revenues) could be used.

**Table 7: SSTEC Transport Sector Key Performance Indicators**

<table>
<thead>
<tr>
<th>KPI Area</th>
<th>Indicative Value</th>
<th>Timeframe</th>
<th>Domestic Standards</th>
<th>Domestic Benchmarks</th>
<th>International Benchmarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of green trips</td>
<td>≥ 30%</td>
<td>By 2013</td>
<td>Garden city standard: proportion of public transportation ≥20% for big cities; ≥ 15% for medium cities.</td>
<td>Tianjin (2000): 91.5%</td>
<td>Rio de janeiro 85%</td>
</tr>
<tr>
<td></td>
<td>≥ 90%</td>
<td>By 2020</td>
<td></td>
<td>Tianjin plan: 75-80% (by 2020)</td>
<td>Bogota 85%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BHNA Plan: 65-75% (by 2020)</td>
<td>Lima 84%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TEDA: 47.8%</td>
<td>Moscow 73.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shanghai (2006): 56%</td>
<td>Curitiba 71%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Beijing (2006): 64% Chongqing(2006): 88%</td>
<td>Warsaw 71.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hong Kong SAR (2001) 83.8%</td>
<td>Budapest 66.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sao Paulo 66.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Amsterdam 66.1%</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Prague 64.4%</td>
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<td></td>
<td></td>
<td>Vienna 64.0%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Berlin 60.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New York ≥60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tokyo ≥ 60%</td>
</tr>
</tbody>
</table>


In 2003, Ministry of Housing, Urban and Rural Development (MoHURD) and Ministry of Transport (MoT) co-initiated the selection of demonstration city of green transport. For this initiative, the two ministries established a set of criteria for assessment of selecting demo cities. Though the selection criteria consist of less quantifiable indicators, they have been since then considered a relevant reference as a general standard of green transport. The criteria was constructed by five elements which are organization and management, planning and development, public transport, infrastructure, and transport environment. Each element has sub-indicators, which makes 66 indicators in total. 28

**Table 8: Proposed Green Transport KPIs**

<table>
<thead>
<tr>
<th>Indicator Category</th>
<th>Indicators: indicative values</th>
<th>Current achievements / Time frame for accomplishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Traffic related emissions reduced [1]</td>
<td>By 15%</td>
<td>By 2020 [1]</td>
</tr>
<tr>
<td></td>
<td>≤40% of all new residential areas [9]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-person-km, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-ton-km</td>
<td></td>
</tr>
<tr>
<td>3 Number of energy efficient cars per 10K vehicles [5]</td>
<td>__ /10K vehicles</td>
<td></td>
</tr>
</tbody>
</table>

28 MoHURD Website [http://www.mohurd.gov.cn/zcfg/sbwj_0/sbwjcsjs/200611/t20061101_157091.html](http://www.mohurd.gov.cn/zcfg/sbwj_0/sbwjcsjs/200611/t20061101_157091.html)
29 These key performance indicators were prepared and compiled by the EC-Link Project. See: EC-Link 2016. *Sino-EU Key Performance Indicators for Eco-Cities*. Beijing (unpublished draft)
<table>
<thead>
<tr>
<th>Indicator Category</th>
<th>Indicators: indicative values</th>
<th>Current achievements / Time frame for accomplishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Non-motorized traffic:</td>
<td>≤10Km in length/km2 [8]</td>
<td></td>
</tr>
<tr>
<td>Dedicated-connected walking paths [8]</td>
<td>≤10Km in length/km2 [8]</td>
<td></td>
</tr>
<tr>
<td>Dedicated-connected biking paths [8]</td>
<td>≤1.5m [8]</td>
<td></td>
</tr>
</tbody>
</table>

Sources:

### 5.5 Verification Methodology

The verification methodology usually proceeds based on an indicator system, such that setting up and systematizing the indicators are the basic as well as the initial steps. Since different evaluators would have different purposes, the first step of identifying indicators is to clarify the evaluators and their purposes. Building up indicator system should then follow a three-step process, which includes a primary selection, set-up of the indicator system, and quantifying indicators.
5.6 Lessons Learnt from Pilot Projects

5.7 Outlook

In 2015, the International Transport Forum (ITF) presented long-run scenarios to 2050 for the development of urban passenger mobility and related emissions and health impacts in
various cities, including China. The model presented different degrees of transport activities and modal shares under different urban policy scenarios.

**Climate-smart transport is a key piece of the sustainable development puzzle.** It is evident that China is now pro-actively moving toward cleaner and smarter mobility. These commitments focus on:

- **Climate-resilient transport:** Climate change puts growth potential, as well as trillions of dollars of transport investments at risk, which is why resilience—and especially, road resilience—is a key part of the global agenda.
- **Clean, safe, and efficient mass transit:** Investing in mass transit systems is a great way to lower the carbon footprint of the transport sector. It also brings a number of additional benefits, including less congestion, safer roads, and more efficient connections to jobs and services.
- **Efficient & Multi-modal transport systems:** Efficient freight systems, particularly fuller and better trucks, can deliver both on lower costs and a lower carbon footprint. Moreover, to maximize the benefits of transport investments, it is important to make sure that different modes complement each other, and to allow people and goods to transfer seamlessly between different means of transport.

Investment in climate-smart transport has the potential to become a true development win-win that positively impacts all aspects of sustainability: environmental, of course, but also social and economic. This is exactly the kind of co-benefits we need to pursue if we are serious about building a greener, inclusive, and prosperous future.

**International Perspective:**

**Clean Power for Transport- Alternative fuel for sustainable mobility in Europe**

The Clean Power for Transport package aims to facilitate the development of a single market for alternative fuels for transport in Europe:

- A Communication laying out a comprehensive European alternative fuels strategy for the long-term substitution of oil as energy source in all modes of transport;
- A proposal for a Directive on the deployment of alternative fuels recharging and refuelling infrastructure;
- An accompanying Impact Assessment;
- A Staff Working Document setting out the needs in terms of market conditions, regulations, codes and standards for a broad market uptake of LNG in the shipping sector


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National Perspective:

The Mobility and Fuels Strategy (MFS) of the German Government

The MFS aims to provide information and orientation on the current status, opportunities and challenges of alternative fuel options and innovative drives, as well as on the effect of energy issues on transport.

The following key questions are addressed:

- Which modes of transport make which demands when it comes to fuels, drives and fuel infrastructure?
- What are the framework conditions and instruments (for sources of energy, efficiency and renewable energies) in Germany and Europe?
- Can the challenges be met with the existing sets of rules and framework conditions, or are changes required?

6 VALUE ADDED and CROSS CUTTING THEMES

Added value and cross-cutting. The added value of policies beyond their direct intended impact (e.g. relieve of congestion through congestion charging) is called co-benefit. Generally co-benefits can be grouped into four topics:

(i) Better energy security. China imported 58% and the EU 84% of its oil consumption in 2013. A high dependence on fuel import makes the economy vulnerable to external shocks and price fluctuations. Oil price volatility has a major detrimental impact on the economy as a whole. Simply reducing the demand for transport fuels will improve energy security – the less oil to be imported the lower the vulnerability to supply constraints or increased oil prices. This can be achieved by (a) improving the efficiency by which fuel is used to provide transport, by encouraging modal shift, (b) improving vehicle efficiencies, (c) introducing measures such as driver training or lower speed limits, and (d) optimising freight logistics. It can also be achieved by (e) reducing the demand for energy-based services in transport through measures such as better urban planning and telecommuting. Finally, the demand for oil can be reduced by (f) introducing alternative fuels such as electricity, biofuels or hydrogen. Energy security is therefore a crucial co-benefit of sustainable transport measures.

(ii) Less externalities. The externalities of a private vehicle-centered urban environment have been described above in detail. Negative external effects private vehicles are costs that are not borne by the driver but by society instead. Beyond reducing the environmental and climate external effects, noise reduction and improvement of road safety are important co-benefits of sustainable transport measures. These health-related cross cutting topics are important considerations in transport planning and can substantially increase the feasibility in terms of a positive economic cost benefit analysis.

(iii) Increased quality of life and economic development. Good air quality, convenient access to public services and availability of urban space for leisure activities is a tremendous competitive advantage of the most sustainable cities in the world. Recent studies have shown that businesses are especially concerned about these soft measures. A sustainable and high-quality transport system has therefore the potential to increase the competitive advantage in terms of attracting highly qualified staff and companies. Increased private investments are as much as consequences of a sustainable transport system as a reduction in travel time which is a direct financial benefit for the traveller.

(iv) Adaptive capacity. Extreme weather events such as flooding, storms, draughts, heavy rain etc. are expected to intensify with climate change. Often existing urban transport systems, especially roads, are severely damaged as a consequence of these extreme events. Building a climate-resilient urban transport system is therefore vital to:

- Safeguard transport infrastructure
- Ensure reliable mobility and economic vitality
- Guarantee the health and safety of urban residents

There are substantial synergies between mitigation and adaption measures in urban transport. While climate adaptive measures such as air conditioning are expected to increase emissions, an urban resilient design is likely to be a compact design. Mixed-use, transit oriented development and urban densification reduces the vulnerability of a city and mitigates emissions at the same time. Reducing the space required for roads and creating more green space can have cooling effects given expectedly higher temperatures in the future. For
megacities the resilience of effective public transport systems is crucial in case of disasters as well. Only mass transit systems are able to evacuate large amount of people in a short time.

Table 9: Synergies between mitigation and adaption in urban transport.

<table>
<thead>
<tr>
<th>Strategic Approach</th>
<th>Main opportunity for synergies</th>
<th>Mitigation</th>
<th>Adaptation</th>
</tr>
</thead>
</table>
| Avoid/Reduce       | Sound land-use planning for compact and transit oriented cities with sufficient green spaces  
Combined with climate-proofed design standards for infrastructure | Short distances reduce land conversion, travel demand and related emissions  
Reliable and high quality public transport, walking and cycling infrastructure maintains low-carbon modes | Parks and green roads provide cooling  
Short distances reduce the total infrastructure requiring adaptation  
Short distances favour walking & cycling  
Resilient infrastructure |
| Shift/Maintain     | High quality public transport (in combination with transport demand management measures  
Combined with climate-proofed design standards for vehicles and contingency planning  
High quality pedestrian and bicycle infrastructure  
Transportation Demand Management (TDM) measures that provide the disincentives to private motorised vehicle use | High-quality public transport attracts more customers and reduces car trips  
Less road space is needed  
Less CO₂ emissions per passenger kilometre | High-quality public transport (e.g. include air-conditioning) is necessary to maintain mobility of those without access to a car  
Reliable public transport is vital for disaster management/evacuation |
| Improve            | Procurement of efficient and resilient vehicles  
Vehicle standards | Energy efficient vehicles reduce the carbon emissions per kilometre | Resilient vehicles are necessary to maintain mode share (reliable and comfortable public transit)  
As far as possible, air conditioning should not be based on HFC but CO₂ (lower warming potential) |

Source: Eichhorst (2009)
**Value added**
Non-motorized transport incorporated in transport planning: extensive and safe bike ways or cycling networks; park and ride systems; intermodal transfers; integrated ticketing for various types of public transport.

Integrated open spaces (walk ways, cycle lanes); easy access to public transport.

Vehicle and fuel transition technologies incorporated (hybrid vehicles; use of alternative fuels like biodiesel, biogas or compressed natural gas [CNG]; electric vehicles; hydrogen vehicles; liquid petroleum gas [LPG]).

Emphasis on mass transit.

Energy efficiency considered;

Use of renewable resources for infrastructure materials, with low embodied energy.

Less car intensive lifestyle (Car pooling; car sharing; Car/ driver licence exit strategies; Cycling; Bike sharing).

Use of Information and Communication Technology (ICT) for traffic management, and for demand-responsive transport (such as pooled private transport services).

Parking management.

**Cross-cutting themes**
Climate Change Mitigation and Adaptation (GHG emission planning).

Sustainable land management.

Respect for biodiversity.

Livelihood aspects.

Land use planning (consideration for mixed use development, multi-modal transport hubs, urban density, infrastructure networks), access restrictions; car-restricted zones; traffic reductions through speed reductions; congestion pricing.

Smart management technologies.

Fleet management.
7 RECOMMENDED READING

Further readings:

European Environment Agency Report on Adaption of transport to climate change:

Guidance Tool Adaptation Compass: Based on their experience, the EU project’s Future cities partners developed a practical tool to check the vulnerability and adaptation options across sectors.
Tool: http://www.future-cities.eu/project/adaptation-compass/

GIZ Sourcebook: Adapting Urban Transport to Climate Change

Assessment report: Climate change and urban transportation systems
http://uccrn.org/files/2014/02/ARC3-Chapter-6.pdf

GRABS EU Project: The project will facilitates the exchange of knowledge and experience and the actual transfer of good practice on climate change adaptation strategies to local and regional authorities.

AVAILABLE RESOURCES AND TOOLS

RECOMMENDED READING

Annex 1 Tool GT 1 - Integrated city-wide low-carbon transit plans.

Name: Integrated city-wide low-carbon transit plans

What this tool does: This tool takes a city wide perspective to transport. It advocates planning for all types of transport, public and private, motorized and non-motorized. This integrated planning of city-wide transit measures needs to be well coordinated with the existing urban master plan, or strategic plan.

How does it work:

The 11 steps of Sustainable Urban Mobility Planning

Source: www.eltis.org/mobility-plans
### Example:

#### Urban Transport Policies and Packages

<table>
<thead>
<tr>
<th>Area of Activity</th>
<th>Basic Package Minimum requirements</th>
<th>Advanced Package Standard approaches</th>
<th>Deluxe Package Premium low carbon approaches</th>
</tr>
</thead>
</table>
| 1. Make roads people friendly | • Provide side walks  
• Reduce barriers such as bridges, underpasses and fences  
• Introduce speed limits  
• Provide bicycle lanes | • Establish pedestrian and bicycle short cuts  
• Diverse street environment  
• Trees along roads  
• Separated networks for bicycles and pedestrians (bicycle avenues) | • Public bicycle scheme  
• Shared space concepts |
| 2. Manage parking demand | • Prohibit side walk parking | • Replace minimum with maximum requirements for parking places for cars  
• Provide minimum requirements for parking spaces for bicycles  
• Pricing for existing parking places | • Reduce/limit number of parking spaces in urban areas  
• Zero parking (except for special needs) in new developments |
| 3. Move to high quality public transit | • Make public transport clean and convenient  
• Increase speed through priority signalling | • Integrated ticketing / fares  
• Information / marketing  
• Green procurement of vehicles  
• Bus-only lanes along high-density areas  
• High quality interchange (Design of stations to have short transfer times)  
• Level boarding, and off-bus/metro fare collection to speed up transit | • Comprehensive bus rapid transit system  
• Urban rail network  
• Full integration of public transport modes and with non-motorised transport  
• Full integration with land-use |
| 4. Provide inclusive information | • Information campaigns | • Cooperation with companies (e.g. bike parking)  
• Car-sharing schemes  
• Bike-sharing schemes  
• Car free days | • Travel information (Web 2.0) |
| 5. Reap the benefits of technological advancement | • Incentives to promote clean fuels and vehicles | • Use of Intelligent Transport Systems  
• Green procurement for local fleets (buses, taxis, etc)  
• Full prioritisation of public transport and non-motorised transport through priority signalling and ITS | |
6. Change the role of cars
- Speed limits
- Physical car restrictions to slow down speed (e.g. roundabouts, barriers)
- Reduce investments in car oriented roads
- Low emission zones
- Intelligent Transport Systems (ITS)
- Limitation of access to city centres
- Congestion charge
- Advanced city toll

7. Reinvent mixed-used, high density cities
- Retain and reinvent dense urban fabric (mixed-use structures)
- Forbid large retail and leisure facilities, that are not integrated in the settlement structure
- Incentivize mixed-use city quarters (shopping, leisure, work, living)
- Land use regulation (e.g. restriction of greenfield shopping)
- Transit-oriented development (e.g. Curitiba developing in linear corridors along BRT)
- Green belts or corridors to keep dense areas (Hong Kong)
- Advanced integration of land-use and transport into planning
- Accessibility of public transit (maximum walking time to public transport station below 5 minutes)

8. Create/Live in urban spaces
- Wide side-walks
- Pedestrian areas
- Urban greening (shadow trees, lakes and rivers,
- Diversity (of buildings, people, infrastructure)
- Small public places (with small business and gastronomy)
- Adapted architecture

Battling Traffic Congestion

There’s no silver bullet solution to the problem of gridlock—next generation urban transport systems will connect transportation modes, services, and technologies together in innovative new ways that pragmatically address a seemingly intractable problem.

Source: https://www.pinterest.com/pin/480126010253295507/sent/?sender=305682030866350581&invite_code=df46dd5806d307626b42919192d843e
The Future of Mobility in Cities: Multimodal and Integrated

Ten principles developed by international non-governmental organizations are designed to guide urban decision-makers toward the best outcomes for the transition to new mobility options.

Sustainable, inclusive, prosperous, and resilient cities depend on transportation that facilitates the safe, efficient and pollution-free flow of people and goods, while also providing affordable, healthy, and integrated mobility for all. Innovative shared and autonomous transportation services can have profound impacts on community quality of life and resident's access to opportunity.

A new international working group developed the following ten principles to guide urban decision-makers and stakeholders toward the best outcomes for the transition to new mobility options.

1. **We plan our cities and their mobility together.** The way our cities are built determines mobility needs and how they can be met. Development, urban design and public spaces, building and zoning regulations, parking requirements, and other land use policies shall incentivize compact, accessible, livable, and sustainable cities.

2. **We prioritize people over vehicles.** The mobility of people and not vehicles shall be in the center of transportation planning and decision-making. Cities shall prioritize walking, cycling, public transport and other efficient shared mobility, as well as their interconnectivity. Cities shall discourage the use of cars, single-passenger taxis, and other oversized vehicles transporting one person.

3. **We support the shared and efficient use of vehicles, lanes, curbs, and land.** Transportation and land use planning and policies should minimize the street and parking space used per person and maximize the use of each vehicle. We discourage overbuilding and oversized vehicles and infrastructure, as well as the oversupply of parking.
4. **We engage with stakeholders.** Residents, workers, businesses, and other stakeholders may feel direct impacts on their lives, their investments and their economic livelihoods by the unfolding transition to shared, zero-emission, and ultimately autonomous vehicles. We commit to actively engage these groups in the decision-making process and support them as we move through this transition.

5. **We promote equity.** Physical, digital, and financial access to shared transport services are valuable public goods and need thoughtful design to ensure use is possible and affordable by all ages, genders, incomes, and abilities.

6. **We lead the transition towards a zero-emission future and renewable energy.** Public transportation and shared-use fleets will accelerate the transition to zero-emission vehicles. Electric vehicles shall ultimately be powered by renewable energy to maximize climate and air quality benefits.

7. **We support fair user fees across all modes.** Every vehicle and mode should pay their fair share for road use, congestion, pollution, and use of curb space. The fair share shall take the operating, maintenance and social costs into account.

8. **We aim for public benefits via open data.** The data infrastructure underpinning shared transport services must enable interoperability, competition and innovation, while ensuring privacy, security, and accountability.

9. **We work towards integration and seamless connectivity.** All transportation services should be integrated and thoughtfully planned across operators, geographies, and complementary modes. Seamless trips should be facilitated via physical connections, interoperable payments, and combined information. Every opportunity should be taken to enhance connectivity of people and vehicles to wireless networks.

10. **We support that autonomous vehicles in dense urban areas should be operated only in shared fleets.** Due to the transformational potential of autonomous vehicle technology, it is critical that all AVs are part of shared fleets, well-regulated, and zero emission. Shared fleets can provide more affordable access to all, maximize public safety and emissions benefits, ensure that maintenance and software upgrades are managed by professionals, and actualize the promise of reductions in vehicles, parking, and congestion, in line with broader policy trends to reduce the use of personal cars in dense urban areas.

Key Features of Digital Age Transportation Systems

- **Massively Networked:** Ubiquitous connectivity throughout the transportation system between vehicles (V2V), between vehicles and their surrounding infrastructure (V2I), and between transportation systems and their users.

- **User Centered:** A mobility paradigm centered around the user’s needs, priorities, data flows, and dynamic responses.

- **Integrated:** A well-connected system of systems that enables users to easily move from point A to point B regardless of mode, service provider, etc.

- **Dynamically Priced:** Variable pricing of road, parking, and shared use assets to balance supply and demand.

- **Reliant on New Models of Public-Private Collaboration:** Transportation needs will be met by an increasingly diverse ecosystem of public, private, and nonprofit entities.

https://www.pinterest.com/pin/56679565594955685/sent/?sender=305682030866350581&invite_code=1c7fa68f0f1ec743c4cb8a42b1b9ad53
Literature / further information:


**Name:** Emission assessment of low-carbon transport modes

**What this tool does:** This tool is very technical in nature, but it supports important policy decisions in favour of technology choices regarding investments in transport technologies. Its application is a specialist’s job, but the underlying principles are important.

**Steps for Data Collection and Development of Baseline, Impact Estimates, and Calibration over Project Lifetime**

Source: ITDP (see reference below).
How does it work:

### Emission factors

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Speed km/hour</th>
<th>Fuel Type</th>
<th>Fuel Efficiency @ 50 km/l</th>
<th>CO₂ emissions factor per liter of fuel</th>
<th>CO₂ emissions per km</th>
<th>Average CO₂ emissions per veh type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Petrol</td>
<td>Diesel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cars</td>
<td>22</td>
<td>95%</td>
<td>5%</td>
<td>9</td>
<td>11</td>
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<tr>
<td></td>
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<td>Diesel</td>
<td>2.94348</td>
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<td>0.3065G6667</td>
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<tr>
<td></td>
<td></td>
<td>All Fuels</td>
<td>2.57529</td>
<td>0.2575909</td>
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<td>0.304105</td>
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<tr>
<td>2-Wheeler</td>
<td>22</td>
<td>100%</td>
<td>100%</td>
<td>60</td>
<td>0</td>
<td>2.75424</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>3-Wheeler</td>
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<td>100%</td>
<td>100%</td>
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<td>Bus</td>
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<td>2.2</td>
<td>2.75424</td>
</tr>
<tr>
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<td>Jeepney/RTV</td>
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<td>Cycling</td>
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<td></td>
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<tr>
<td>LRT</td>
<td></td>
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</tr>
</tbody>
</table>

Source: ITDP (see reference below).

#### Calculating Direct GHG Emission Reductions for Transport Projects

Does the activity in the project logframe include tangible installations?

- **Yes**:
  - Sum of avg. annual GHG reduction from project activity
  - Emissions factor (inc. upstream emissions) per mode/fuel affected
  - Δ in fuel use for each mode/fuel affected
  - Secondary Direct Effects (net of over a 20 yr. max lifetime)

- **No**: no direct reductions

Average useful lifetime of investment in transport sector (years)

Average lifecycle (Defaults)

Secondary Direct Effects (net of over a 20 yr. max lifetime)

Sum of all activity-level reductions

Total Direct Impact

Source: ITDP (see reference below).
Handbook of Emission Factors for Road Transport (HBEFA)

Framework to localise HBEFA

- On road driving data collection, GPS recording second by second
- Driving data pre-process, map matching
- Develop local driving cycles/traffic situations

Real measurement of typical vehicles in China

- Validate the PHEM Model to China Context

Using PHEM Model to generate new emission factors

Emission Factors Database in China

Emission modelling framework and formula

\[ \text{Emissions (kg)} = \sum_i \left( \text{Source Activity (VKT, km)} \times \text{Specific emission intensity (g/km)} \right) \]
Different national and international emission inventory models are being used in Europe and the USA including:

- Handbook of Emission Factors for Road Transport (HBEFA) for a number of EU countries
- COPERT for the EU and EU countries
- TREMOVE for the EU
- TREMOD for Germany
- MOVES for the USA
- EMFAC for California
- IVE for developing countries

HBEFA approach for development of country specific CO2 emissions in Europe (Source: INFRAS, 2013)

**Literature / further information:**

- GIZ (Shengyang Sun (GIZ), Martin Schmied (INFRAS), Daniel Bongardt (GIZ), Philipp Wüthrich (INFRAS), Urda Eichhorst (GIZ)). 2015 (?). Modelling Urban Transport Emissions for Better Air and Climate Protection. Beijing. [www.sustainabletransport.org](http://www.sustainabletransport.org)

Annex 3 Tool GT 3 - Technologies for low-carbon transport.

<table>
<thead>
<tr>
<th>Name: Technologies for low-carbon transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>What this tool does: This tool supports decision makers in their choices for low-carbon transport modes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport type</th>
<th>Low-carbon technologies recommended</th>
</tr>
</thead>
</table>
| Public transport: convenient and rapid | Low-carbon or zero emission “clean” buses:  
  • electric buses (from renewable sources)  
  • trolley buses (electricity from renewable sources)  
  • trolley and battery driven  
  • methane gas technology  
  • bio-diesel technology  
  • gas (Liquified natural gas – LNG; or compressed natural gas - CNG)  
  • fuel cell technology (or hybrid versions of fuel cells and batteries)  
| Trams and urban trains:  
  • electric trams (electricity from renewable sources) |
| New Metro Systems – underground, overground, or mixed  
  • electric metros (electricity from renewable sources) |
| Supportive technologies:  
  • intelligent information management systems for passengers  
  • Intermodal exchanges between public transit systems |

<table>
<thead>
<tr>
<th>Transport type</th>
<th>Low-carbon technologies recommended</th>
</tr>
</thead>
</table>
| Private vehicular transportation | Cars:  
  • electrical cars (electricity from renewable sources)  
  • electrical cars with gasoline back-up motor (hybrid model)  
  • fuel cell technology (or hybrid versions of fuel cells and batteries)  
| Motorbikes:  
  • Electro-bikes (electricity from renewable sources) |
| Supportive technologies:  
  • Car sharing  
  • Bike sharing |

<table>
<thead>
<tr>
<th>Transport type</th>
<th>Low-carbon technologies recommended</th>
</tr>
</thead>
</table>
| Non-motorized transit | Bicycles  
  • conventional bicycles (non-motorised)  
| Walking |

Source: EC-Link
How does it work:

The following tables provides an overview of travel impacts, and greenhouse gas (GHG) reductions, and the relevance of these options for Chinese cities.

Table 2: Transport Demand Management

<table>
<thead>
<tr>
<th>Sustainable Urban Transport Policies</th>
<th>Travel impacts and GHG reduction</th>
<th>Relevance to Chinese cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transit service improvements</td>
<td>Increases modal share of public transit and reduces car-driving for all travel purposes. GHG reduction most effective, if implemented city-wide.</td>
<td>Almost all Chinese cities upgrade their public transit systems. But in many of them, the overall travel-chain from-door-to-door does still not provide high levels of convenience.</td>
</tr>
<tr>
<td>Walking and cycling improvements (non-motorised transport)</td>
<td>Increases modal share of walking and cycling for short distance trips (up to 5 km) and reduces car-driving for all travel purposes. GHG reduction especially high, if implemented in mixed-use city quarters or as feeder to public transit.</td>
<td>Traditionally non-motorised modes were strong in China. Currently walking and cycling lack a positive image in society and infrastructure for bikes has been reduced. However, it is still better than in many other countries and there is a strong trend toward electric bikes.</td>
</tr>
<tr>
<td>Corporate Mobility Management programmes</td>
<td>Reduces automobile travel especially for commuting. GHG reduction especially high, if major employers participate.</td>
<td>Many employers in China do not yet apply corporate mobility programmes. A growing number of Chinese companies develop environmental or sustainability strategies.</td>
</tr>
<tr>
<td>Parking management and pricing</td>
<td>Reduces automobile travel. GHG reduction most effective, if implemented city-wide and high quality public transit systems are in place.</td>
<td>Parking is a key challenge in many Chinese cities. First steps have been taken but it still is a long way to comprehensive parking strategies. The growing numbers of automobiles require urgent action.</td>
</tr>
<tr>
<td>Efficient road pricing</td>
<td>Reduces urban-peak automobile travel, especially for commuting. GHG reduction highly depending on zone where applied.</td>
<td>Congestion pricing is so far not implemented in Chinese cities. There might be some potential in very congested areas, especially if combined with vehicle restrictions.</td>
</tr>
<tr>
<td>Vehicle restrictions</td>
<td>Reduces automobile travel in certain times or areas. GHG reduction highly depending on time when or zone where applied.</td>
<td>Many Chinese cities have experience with vehicle restrictions that are increasingly connected to fuel types (e.g. exemptions for EVs).</td>
</tr>
<tr>
<td>Smart growth land use policies</td>
<td>Shifts modes and reduces vehicle travel (VKT) simultaneously. GHG reduction especially high in a long-term perspective of more than 10 years.</td>
<td>Many Chinese cities are auto-oriented and separate living and working. Considering the rapid growth of urbanization (up to 15M people move to cities every year) such strategies are of utmost importance.</td>
</tr>
</tbody>
</table>

The Importance of Cars in Cities needs to be Reduced

How most traffic engineers see your city

How cities should be designed

Photo by Mikael Colville-Andersen on Flickr (cc)
https://www.pinterest.com/pin/467530005039972243/sent/?sender=305682030866350581&invite_code=d48f078d07502e5058863636cc132c8d
Bikelanes in Cities: Changes in Profiles of Urban Streetscapes

https://www.pinterest.com/pin/487444359652704174/sent/?sender=305682030866350581&invite_code=8944fccc45df4299e607b03e0091397

http://nacto.org/publication/urban-street-design-guide/
and
https://www.pinterest.com/pin/367817494551034308/sent/?sender=305682030866350581&invite_code=1ef5462afe210a3f87125115345ca78d
Rethinking the Street Space: Why Street Design Matters

Source: http://www.planetizen.com/node/39815
A truly complete “Green” street

Source:  
https://www.pinterest.com/pin/375980268873758500/sent/?sender=305682030866350581&invite_code=f6d340986382d68abaf7369718252ae9

Green Boulevard

Source: National Association of City Transportation Officials “Global Street Design Guide”  
https://www.pinterest.com/pin/49598977692572617/sent/?sender=305682030866350581&invite_code=e4ec136447052ba43261cd4292aef6b

Designing roads for Sustainable Transport - Public Transport, Parking and Cycle Lanes

Source: NATCO Urban Street Design Guide. “Global Street Design Guide”  
https://www.pinterest.com/pin/548383692110860259/sent/?sender=305682030866350581&invite_code=90f8b48d82ea0b818639a45053a0648e
Roundabout design - Separated Bike Lanes. Visit the slowottawa.ca for detailed guides.

https://www.pinterest.com/pin/433964114077526651/sent/?sender=305682030866350581&invite_code=e7fa09869937da1c50b988341bc7c136

Integrating Clean Public Transport into existing street profiles

https://www.pinterest.com/pin/220957925447920404/sent/?sender=305682030866350581&invite_code=8dbef0df066a4217c310bb33569265ce
**Literature / further information:**


Annex 4 Tool GT 4 - Planning for non-motorized transport.

<table>
<thead>
<tr>
<th>Name:</th>
<th>Planning for non-motorized transport</th>
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</thead>
</table>

**What this tool does:** Non-motorized Transportation (also known as Active Transportation and Human Powered Transportation) includes Walking and Bicycling, and variants such as Small-Wheeled Transport (skates, skateboards, push scooters and hand carts) and Wheelchair travel. These modes provide both recreation (they are an end in themselves) and transportation (they provide access to goods and activities), although users may consider a particular trip to serve both objectives. For example, some people will choose to walk or bicycle rather than drive because they enjoy the activity, although it takes longer.

**How does it work:**

There are many specific ways to improve non-motorized transportation:

- Improve sidewalks, crosswalks, paths and bike lanes.
- Correct specific roadway hazards to non-motorized transport – lack of signage, difficult level crossings, lack of traffic lighting.
- Reduce conflicts between users (pedestrians, cyclists, cars).
- Improve maintenance and cleanliness of cycle lanes.
- Design systems that accommodate people with disabilities and other special needs.
- Develop pedestrian oriented land use and building design.
- Increase road and path connectivity, with special non-motorized shortcuts, such as paths between cul-de-sac heads and mid-block pedestrian links.
- Street furniture (e.g., benches) and design features (e.g., human-scale street lights).
- Traffic calming, streetscape improvements, traffic speed reductions, vehicle restrictions.
- Plan and design roadways to increase walking and cycling safety.
- Safety education, law enforcement, promotion of cycling and walking.
- Integration of cycling with public transit.
- Parking facilities for bicycles.
- Manage security concerns of pedestrians and cyclists.
- Introduce and manage public, automated bicycle rental systems designed to provide efficient mobility for short, utilitarian urban trips.
- Build pedeways (“walkways”) which are indoor urban walking networks that connect buildings and transportation terminals.
- Create an information system (maps, digital application systems) to guide users to multi-modal transport systems which explain how to walk or cycle to a particular destination.

**Sources:**

Non-Motorized Transportation planning – Identifying ways to Improve Pedestrian and Bicycle Transport. [http://vtpi.org/tdm/tdm25.htm](http://vtpi.org/tdm/tdm25.htm)

STUDIES SHOW PEOPLE WILL WALK TO DESTINATIONS:

46% 1 mile Church or School

1% 3-4 miles Church or School

35% 1 mile Work

1% 3-4 miles Work²

https://www.pinterest.com/pin/187954984420077086/sent/?sender=305682030866350581&invite_code=1385beaebabe1f141bb9d34f2f87723
Examples:

- **Conventional bike lane**
  Source: www.pedbikeimages.org / Dan Burden

- **Conventional bike lane**
  Source: www.pedbikeimages.org / Carl Sundstrom

- **Buffered bike lane**
  Source: Kittelson & Associates

- **Buffered bike lane alongside on-street parking**
  Source: www.pedbikeimages.org / Steven Faust

- **Contra-flow bike lane**
  Source: Kittelson & Associates

- **Contra-flow bike lane**
  Source: www.pedbikeimages.org / Dan Burden

Literature / further information:

The Europe-China Eco Cities Link (EC-Link) Project is funded by the European Union in cooperation with the Ministry of Housing and Urban-Rural Development (MoHURD), implemented by the European Consortium led by GIZ.

中欧低碳生态城市合作项目由欧盟资助与住房和城乡建设部合作
由德国国际合作机构等提供技术支持